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Economical Machining of Single Pieces

Causes of Loss in Setting Up Machine Tools for Repair or Replacement Jobs Discussed—Handling of Work by Planning Department Advantageous

BY ALBERT A. DOWD*

THERE is probably no greater source of loss to the average manufacturer than that incurred when setting up machine tools for single jobs. When a given piece of work is to be manufactured *in quantity*, the methods of setting and holding and the various tools used always receive due consideration, but when a *single piece* is to be machined on a milling machine, shaper, engine lathe, or other machine, the operator generally is left to use his own judgment as to tools and general method of setting up. It is the purpose of this and articles to follow to point out the many chances for loss and to suggest more careful methods and better supervision in various lines of manufacture.

One of the principal reasons for the operator's excessive time in setting up a job is that he does not always have ready access to the various blocks, clamps, etc., needed for the work. Another reason is that he does not think out beforehand just how he is going to do the work. Different shops have their own methods of routing work, so that with one system excellent results may be obtained while in another factory the same scheme might not apply equally well. In the tool room, for example, the toolmaker may be allowed to plane or shape up the various parts of a jig or fixture himself, or the different pieces may be finished by another man and delivered to the toolmaker for the final fitting, locating of blocks, clamps, etc. This method is a step in the right direction and invariably results in considerable saving of time. So also in other departments there are often opportunities for saving in various ways connected with the setting up of work and machine when it is used only on a few pieces. By pointing out errors which are often made and by suggesting remedial measures, attention is called to important points which would otherwise perhaps escape notice.

Adequate Planning and Supervision Essential

Economical production in the shop is the result of intelligent planning combined with careful supervision of the kind that directs the method of handling the work rather than the kind which gives the actual machining processes only casual attention. Time losses such as those caused by an operator hunting "all over the shop" for suitable clamps, parallels, angle plates and other accessories, may be prevented easily by using an efficient system of recording and classifying such items. The method of setting up the work, however, and the losses occasioned thereby, must be made the subject of careful study if actual savings are to be expected. Many an operator spends three or four times as long in setting up a piece of work as he would had a sufficient amount of thought been given to the matter before giving him the job.

As a simple example, let us take the planer department in which there are a number of planers ranging in size from 24 in. to 84 in. and with tables from 60 in. long upward. Parallels, angles, clamps, etc., are, of course, required constantly for setting up work on these machines and it is customary to keep certain sizes of parallels and other accessories near the machine, so that they will be found easily when wanted. When others are required the planer hand goes looking around here and there to find what he wants. Much time is often

Parallels — TOOL RECORD ACCESSORIES — Dept. 12

SIZE	QUANTITY	TOOL NO.	MACH. NO.	REMARKS
½ x 1 x 12	8	A-46	1264	
½ x 1 x 16	12	A-52	1262 1280	
1 x 1 x 24	6	A-54	1213	
1 x 2 x 24	4	A-12	1213	
1 x 2 x 30	8	A-14	1227	
2 x 4 x 48	8	A-116	1227	
2 x 4 x 60	4	A-94	1041	
2 x 6 x 36	4	A-6	1062	I-BEAM SECTION
2 x 6 x 48	4	A-127	1064	" " "

Fig. 1. In Setting Up Machine Tools for Single Jobs One of the Reasons for Excessive Time Spent by the Operator Is That He Has Not Ready Access to the Various Blocks, Clamps and Other Accessories Needed for the Work. A system of giving these accessories a tool number and charging them against the machine at which they are kept is advocated by the author, who suggests the record form shown at the right

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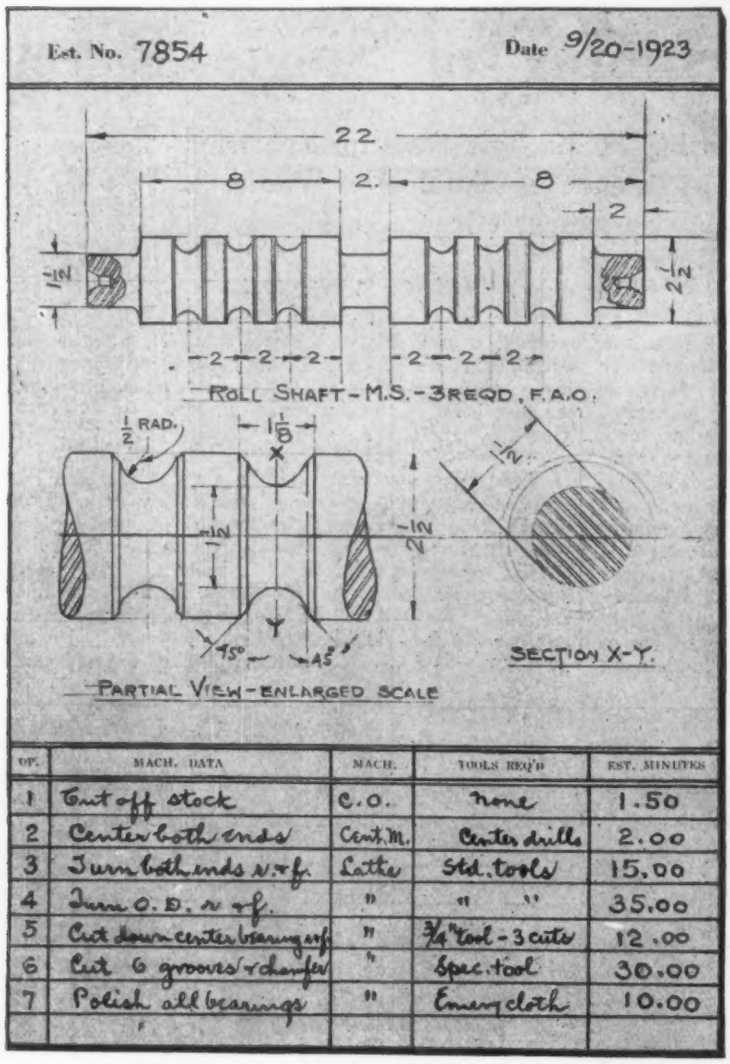
consumed in this process of hunting; one operator says to the other: "Oh, yes, I saw Bill Jones using some parallels just about that size the other day." So a visit is paid to "Bill" at the other end of the department, and it is found that the ones he had were taken by Frank Smith the day before, and, anyway, when the parallels are finally located they are found to be too short—and so it goes.

Tool Crib System for Tools Kept at Machines

Every planer should have space near it where parallels, angles and clamps which are in common use can be kept. These accessories should be given a tool number the same as anything else kept in the "tool crib," and they should be charged against the machine at which they are kept. They should not be taken away from this machine except on an order from the "tool crib," where a record should be kept until they are returned to their proper place. All accessories such as those mentioned should be classified and recorded on suitable cards for ready reference. The system of numbering depends upon the method in vogue in the shop where used, but in general a form like that shown in Fig. 1 will be found convenient.

This record form saves much hunting for different items and the operator may often send his helper to the crib to ask the man in charge for what he wants, for example: for 2 x 4 x 40 in. parallels. The tool man by referring to his card finds that they are charged against machine No. 976, but that they are 48-in. long instead of 40 in. If the operator can use these the helper can go and get them on a tool check and bring them back ready for use when wanted. The same system applies equally well to other items, so that the lost time in hunting for accessories is reduced to a minimum. In other words, the tool crib system should be applied not only to tools in the crib, but also to those kept on or around machines. By recording all accessories and their location it is possible to find quickly anything wanted if the system is properly kept up. It may be argued by some that this is too much trouble, but the progressive executive will recognize the value of the method.



OP.	MACH. DATA	MACH.	TOOLS REQ'D	EST. MINUTES
1	Cut off stock	C.O.	none	1.50
2	Center both ends	Cent. M.	Center drills	2.00
3	Turn both ends N. & F.	Lathe	Std. tools	15.00
4	Turn O.D. N. & F.	"	" "	35.00
5	Cut down center bearing N.F.	"	3/4" tool - 3 cuts	12.00
6	Cut 6 grooves & chamfer	"	Spec. tool	30.00
7	Polish all bearings	"	Emery cloth	10.00

Fig. 2. Estimate Sheet for Simple Lathe Work

Cost Reduced by Systematic Arrangement

It is the writer's belief, based on actual shop practice, that an examination of records showing the cost of different operations on many short jobs will often show a very large percentage of loss, much of which can be obviated by a more systematic arrangement.

Half-way measures should not be adopted by executives who intend to make worthwhile reductions in setting-up expenses. A fixed determination to save is the first step in the process, and it must be realized that improvement cannot be obtained without some changes in the regular system. Some factories employ a "set-up man" for various types of machines and, while this system is all right as far as it goes, when long jobs are considered, for short jobs one man would not be able to keep up with the requirements, and there would be a considerable loss of time by operators waiting between jobs for the set-up man. A great deal depends upon the size of the shop and the grouping of the machines. The class of operators also has an effect, so that on certain machine tools it may be best to let the operator set up the machine according to verbal or written instructions; on others, where less skillful operators are used, some assistance may be necessary. The system used may be made flexible enough to cover both conditions.

Planning Department Handles Setting-Up Work

Let us start with the assumption that a special section of the planning department is to be established for setting-up work; that this section is well provided with data regarding machine tools and accessories; and that it is closely in touch with the shop foremen. Under these circumstances a process similar to the following may be used to advantage. If the estimated time is given for a certain job which is to be put through the shop, the estimate must be the basis for the method used. Properly made estimates, therefore, would contain data regarding method proposed, machine recommended, etc. If the work were to be done on an hourly basis without previous estimating, the planning department should draw up the necessary data for the routing of the work and should also make a time estimate so that an excessive amount of time used on the job will be readily detected from the records.

Assuming that a repair or replacement job on which an estimate has been made is ready to be put into the shop, the steps to be taken then would be about as follows:

1. Copy of estimate and blue print furnished "set-up man."
2. Job number assigned and suitable records made.
3. Delivery date noted.
4. Shop foreman consulted for machine selection.
5. Set-up data drawn up and delivered to foreman with time allowance.
6. Various accessories specified located set aside in tool crib.

The example given represents only one job, of

Job No. S-253 Delivery Date 10-22-23

SET UP DATA SHEET

B. P. No. A-1436 Material M.S.

OP. NO.	DESCRIPTION OF OPERATOR	MACH.	TOOLS REQ'D	LOCATION
3	Turn both ends R. and F.	LA.18	Std.	Crib.
4	Turn O.D. R. and F.	LA.18	Std.	Crib.
5	Cut down center bearing R. and F.	LA.18	3/4" sq. nose 3/4" round corners	Crib. "
6	Cut 3 grooves and chamfer (1 cut)	LA.18	Steady rest. Formed tool	Crib. Spec.
7	Cut other 3 grooves	LA.18	Steady rest Formed tool	same "
8	Polish all bearings	LA.18	Emery cloth	crib

Fig. 3. Set-Up Data Sheet for Lathe Operation

course, but the set-up man may have a dozen or more jobs in his hand when he consults with the shop foreman. A considerable amount of work can be looked over in a few minutes in this way without severe inroads on the foreman's time.

In order to illustrate the process in some detail let us follow through an example, after which actual setting-up methods for various kinds of work can be considered.

Example of Setting Up Plain Work

Fig. 2 is an example of a lathe job on which an estimate has been made and the contract secured. The work *A* is of machine steel, finished all over as shown and grooved as indicated. The estimate sheet gives information as to the various operations to be performed and the amount of time allowed for the job. The set-up man takes the data given and proceeds systematically to list the tools and accessories needed for the work after talking with the foreman and making sure that a certain machine will be used for the work.

Fig. 3 indicates a form useful in listing tools, while Fig. 4 is a blank used for free-hand sketching to outline tools and method of setting up. Referring to Fig. 2 we find that the estimate calls for seven separate operations, several of which require no special tools or accessories. Operations 3, 4, 5 and 6, however, are strictly machine-tool operations, although they are all of a simple nature. The set-up man does not need to consider operations 1 and 2, nor does operation 7 require any thought. On his sheet, therefore, as shown in Fig. 3, he includes only the operations mentioned, viz., 3, 4, 5 and 6 and gives data regarding tools used and where they can be found. A record of this sort is preferably made on a printed form on thin paper, which can be blue printed and sent into the shop with the job card. The original record is kept on file in the "set-up section" of the planning department.

From Fig. 2 it may be noted that there are six grooves spaced a given distance apart, and these grooves must be located accurately from the center bearing *B*. As there are only three pieces required, and it would hardly pay to make gages for the distances. A simple templet, however, like that shown at *X* in Fig. 4, will help a great deal to preserve uniformity in the tool setting. There are also radius tools required like that shown at *Y* in the same illustration. Aside from these two tools there is no special equipment required for any part of this work.

If the set-up man has as broad an experience as it might be considered he should have he might very easily question the operation as specified on the original estimate for the reason that any grooving operation on a long piece like this would be likely to produce "chatter" unless the work were well suported. He might, therefore, separate the sixth operation into two parts, using a steady rest for supporting the work while cutting three grooves on one side and then changing to cut the other three grooves in another setting. Undoubtedly this would be a much better way to do the work, as it would give substantial support and permit of more rapid cutting. We would, therefore, specify the operations separated according to the suggestion given and we would add one steady rest to the list of tools required.

This particular example is a simple one and has been given principally to illustrate the process used rather than to show any great advantages derived from it, although it is evident that there really would be considerable saving in time and an improvement in the quality of the work produced.

(To be continued)

Job No. S-253 Delivery Date 10-22-23

SET UP SKETCH SHEET

B. P. No. A-1436 Material -M.S.

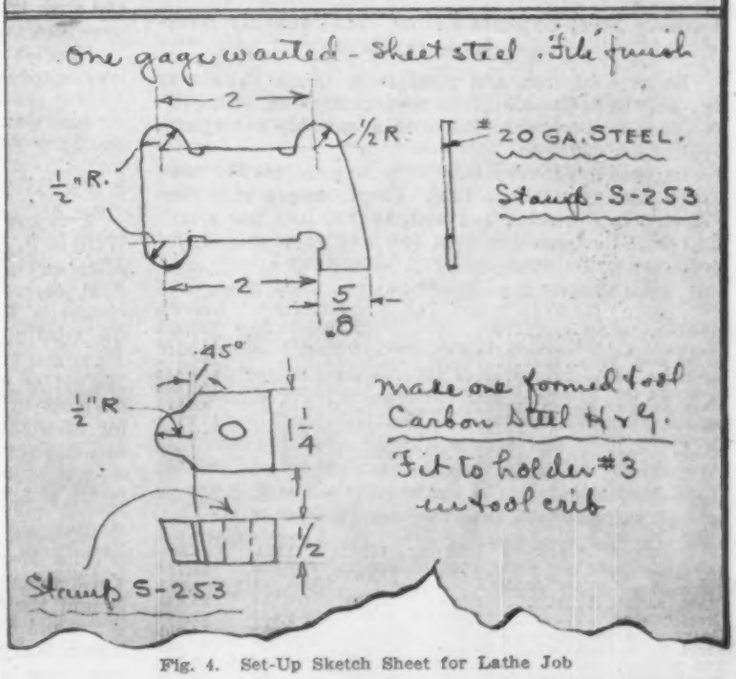


Fig. 4. Set-Up Sketch Sheet for Lathe Job

WOULD DRAFT INDUSTRY

Mr. Baruch Advocates Giving President Greater Power in War Time

WASHINGTON, April 1.—Giving the President authority to mobilize money and industries, as well as man-power, during war, was urged by Bernard M. Baruch, former chairman of the War Industries Board, in the course of testimony on Friday of last week before the House Committee on Military Affairs. Mr. Baruch presented his views at the suggestion of the committee, which is considering measures designed to "take the profit out of war." His testimony was of a more general character than that presented previously by Robert S. Brookings, formerly chairman of the Price Fixing Committee of the board.

Mr. Baruch explained methods of operations of the War Industries Board and related its experiences during the war with regard to numerous subjects, including the fixing of prices of steel and the manner of allocating steel requirements for the United States and allied powers, and spoke in commendatory terms of the cooperation received from industries of the country. His testimony was similar to that which he has stated in the past to committees of Congress, although in some respects he amplified the latter. He was particularly emphatic in the view that the President should be given unlimited power when war is threatened to mobilize industry, labor, money, food and materials, exactly as the soldiers themselves are mobilized. He refrained from indorsing any particular bill and contented himself with urging legislation providing the President with power to conscript wealth, fix prices and regulate production in times of national emergency. He declared that this could be done through a medium of an organization such as the War Industries Board, and expressed the view that had the board been in operation earlier it would have been possible to avoid rising prices and the swift economic changes subsequent to the armistice. Mr. Baruch said that the plan to control labor and industry and to fix prices in time of war "was entirely practicable and highly necessary from a moral standpoint." He took occasion, however, to combat attacks which have been made on the performances of industry and labor during the war.

"American industry and American labor acted fairly toward the Government during the war," said Mr. Baruch, "and I think that assertions to the contrary are not justified." Industrial mobilization, Mr. Baruch declared, should be broad and comprehensive and built up to the highest point of efficiency, and based on experiences during the war.

Mr. Baruch said he would have the industrial strategist working under the President, be in constant and intimate touch with the military authorities and that those acting for the President would proceed at once to the mobilization of men, labor, money, materials and foods. Wealth, Mr. Baruch told the committee, should pay its share of the war burden. It was asserted that if the average young man was willing to go to war at a low wage and endure discomforts of life in the field, the man of money remaining at home should be put on "short rations."

The industrial strategist, together with the military authorities, Mr. Baruch said, would fix all the prices, including those for labor, and would regulate distribution.

"The military authorities should put into effect a draft of the entire population, from which the required number of men should be drawn, and place the necessary orders for equipment and material," he said.

"The industrial strategist would then indicate from what industries the men should be taken, giving the draft boards a list of the essential and less essential industries. The industrial strategist would immediately declare not alone what industries were essential and less essential, but what proportion of its peace time quota each industry should be permitted to produce. With the fixing of prices it would be unlawful either to buy or sell at a different price.

"Money would be mobilized the same as men and material, because a price would be fixed at which money could be and should be used, but the money would be allocated for the purpose of winning the war the same as in the case of men and material.

"The railroads would be under the control of this strategy board in my plan. Food should be administered separately."

It is not believed that any of the bills designed to "take the profit out of war" will be enacted at this session, if at all. While it is apparent that sentiment is in favor of holding down profits and of mobilizing industry and man power, there are many whose experience convinces them that the question is more or less academic and that as a matter of fact the President, through popular support itself, if not by actual constitutional authority, has almost unlimited power during a national emergency.

BRITISH FOREIGN TRADE

January Steel Exports Below 1923 Monthly Average—Imports Heavy

Exports of iron and steel from Great Britain in January were 345,455 gross tons, comparing with 361,264 tons in December and with a monthly average in 1923 of 369,800 tons.

Imports in January were very large at 182,611 tons, exceeding any month in 1923. They compare with 158,972 tons in December and with 127,800 tons per month in 1923. Comparative data for both exports and imports are as follows:

British Steel Exports and Imports, Gross Tons

	Exports	Imports
October, 1923	401,475	117,372
November, 1923	403,261	117,628
December, 1923	361,264	158,972
January, 1924	345,455	182,611
Average per month, 1923	369,800	127,800
Average per month, 1922	295,980	82,215
Average per month, 1921	144,885	152,734
Average per month, 1920	274,881	128,685
Average per month, 1919	188,519	50,801
Average per month, 1913	420,757	195,264

More detailed data of the exports are as follows:

Principal British Exports, Gross Tons per Month

	1913	1923	January 1923	January 1924
Pig iron } Ferroalloys }	93,700	74,100	72,978 / 15,744	39,128 / 8,592
Steel rails	42,200	25,700	16,583	21,841
Steel plates	11,200	17,700	9,603	11,687
Galvanized sheets	63,500	53,800	52,257	54,809
Steel bars, rods, etc.	20,900	31,500	28,865	27,463
Tin plates	41,200	48,300	42,156	51,704
Black plates and sheets	11,700	29,500	25,896	30,339

Exports of scrap iron and steel in January were 7731 tons, compared with 9815 tons per month in 1923 and with 12,880 tons per month in 1922. In 1913 they were 9600 tons per month.

Data as to importations of importance are as follows in tons per month:

	1913	1923	Jan., 1924
Iron ore	620,000	487,580	559,072
Manganese ore	50,100	43,420	22,053
Pig iron and ferroalloys	18,000	9,157	14,364

A report of the executors of the estate of the late William P. Snyder, filed with the Register of Wills of Allegheny County, Pittsburgh, discloses that the principal income was in the form of dividends paid by the Shenango Furnace Co., one of the Snyder properties. On April 30, 1923, that company paid $78,000 in dividends and $130,000 on July 30, Oct. 30, and Jan. 3, 1924. The estate was inventoried at $9,563,809 and after the payment of taxes and other expenses, there remained for distribution property valued at $7,458,130. Total earnings for the estate from the time executors assumed control were $739,771, from which there were disbursements of $21,021.

The Merritt-Chapman & Scott Corporation, New York, submitting the highest bid, amounting to $10,600, bought the hulks of the old battleships Indiana, Alabama and San Marcos at an auction sale at the Washington Navy Yard two weeks ago. The old ships are now lying in Tangier Sound, Chesapeake Bay.

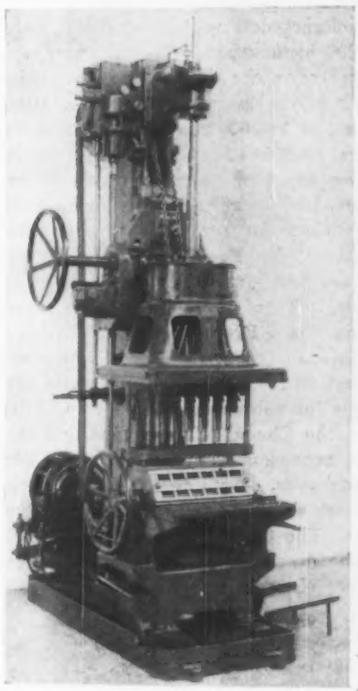
Special Drilling and Tapping Machines

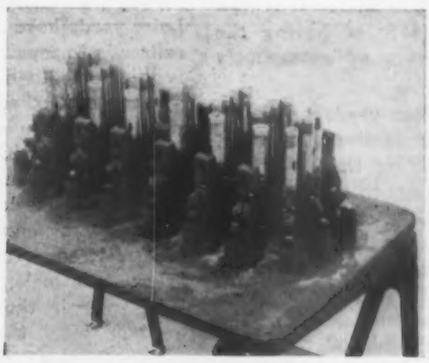
Two special automatic machines originally developed for a company manufacturing electrical equipment and employed in the drilling and tapping, respectively, of pole pieces, have been placed on the market by the Fox Machine Co., Jackson, Mich. A production of 2160 pieces an hour on each machine is claimed.

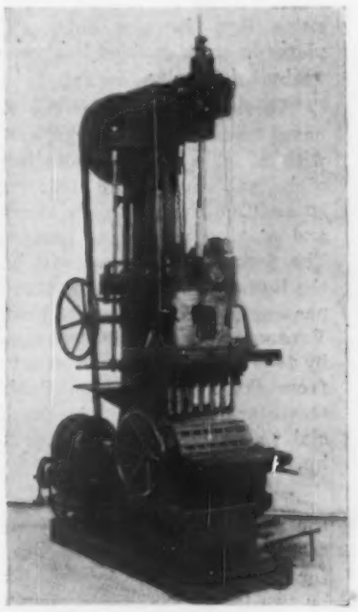
In the automatic drilling machine, which is shown at the left in the accompanying illustrations, there are 12 spindles carried on a cluster plate, and the jig plate is carried with the head. The head is reciprocated automatically by means of a cam developed to provide quick return. The work table is a hexagon drum as shown, having positions for the 12 pole pieces, which are loaded on at the front position. When the head goes up the drum is rotated, bringing the last load to the drilling position and dropping the drilled pieces out at the side of the machine.

The automatic machine for tapping the pole pieces is shown at the right in the illustrations. The head of the machine carries 12 spindles which are also mounted on a cluster plate, and which carry the taps in floating holders. Twelve pole pieces are tapped at one time, the loading being similar to that of the drilling machine. When the work is loaded in the table and the latter rotated to the working position, the operator pulls the right-hand cord or touches the pedal at the lower right-hand side of the machine. This starts the taps revolving in the right-hand direction, and starts the head downward at the same pitch of the taps. When the proper depth has been reached the machine reverses automatically and stops at the top of the stroke. If the operator can load rapidly enough, the machine may be set to reverse automatically and continue to make the complete cycle.

Although the illustration of the cluster plate and spindles shown herewith is not that used in the machines described, the set up is the same in principle. The cluster plate is a patented device intended to permit of combinations not otherwise available and to provide the advantage of standard construction and quick renewals. Vertical adjustment to the standard spindles is also a feature. The plate illustrated has 32 spindles and is employed in drilling bolt holes and water circulating holes in the cylinder head and top of cylinder block of a gasoline motor.







Automatic Multiple-Spindle Machines Arranged for the Drilling and Tapping, Respectively, of Pole Pieces. A production of 2160 pieces an hour from each machine is claimed. There are 12 spindles which are carried on a cluster plate which is similar to that shown above. The cluster plate is a patented device intended to permit of combinations not otherwise available

Pennsylvania Silica Brick Prices Lower

PITTSBURGH, March 31.—The larger Pennsylvania producers of silica brick effective as of March 26, reduced their prices $2 per 1000 to $40. For some time the smaller makers of this product have been naming $40, and even less and the action of the larger makers merely is a recognition of the lower prices and the competitive market conditions. There has been no change in the Chicago and Birmingham prices of this grade of brick and other kinds of refractories are holding at the prices which now have ruled for several months.

General business now is not so good as it was recently, a development that is due in no small measure to the more conservative attitude of the makers of iron and steel with regard to their raw materials purchases. In keeping with the demand for iron and steel, the tendency now is to keep purchases of brick down to actual needs, with practically no anticipation of requirements.

Some of the producers of silica brick are well supplied with business for the second quarter of the year, but this is not a general condition, as is evident from the fact that Pennsylvania brick can be bought as low as $38. Refractories prices are given on page 1049.

Tonawanda Stack Blown Out

BUFFALO, April 1.—The one active stack of the Tonawanda Iron Corporation, subsidiary of the American Radiator Co., was withdrawn from blast March 31 to be down for three to four months, during which improvements will be made to the furnace and to the property. The stack will be equipped with skip hoist and other improvements. New dock, new bins, and new ore bridge will be erected and the stack thoroughly modernized. The other stack of the Tonawanda Iron Corporation which has not been in blast is to be eventually torn down and a new one built, but this will not be in the immediate future. The pig iron requirements of the American Radiator Co. in the interim will be covered by iron now piled.

Contract for rebuilding the first stack has been awarded to the William B. Pollock Co.

FRENCH SHIPYARDS BUSY

Marked Increase in New Work in Three Months—American Plates on Hand for Four Years

BY CAPT. G. L. CARDEN

PARIS, March 22.—During the past week I have visited the French shipbuilding plants along the river Loire. The principal work is carried on at the ports of St. Nazaire and Nantes. The Penhoet shops at St. Nazaire are working 3200 men and require immediately 500 more. The maximum number ever employed by these works was at the outbreak of war in 1914, namely 4200.

The shops of Chantiers Navales de la Loire are employing a total of nearly 3400 men at Nantes and St. Nazaire and are likewise short of help. Working periods of 60 hours per week will soon be started. A third set of shops devoted largely to Diesel engine work is located at St. Denis in the outskirts of Paris.

The Penhoet yards at the beginning of the year had on hand about 30,000 tons of steel plates received in 1918-20 from the United States. This material is now going into the new hulls. The fact of having the plates in stock enabled Penhoet to quote advantageously on hull deliveries.

At the present time the Penhoet yards have two naval vessels on the stocks, and one passenger steamer, with a cable steamer launched during the past fortnight, and three cargo steamers about to be laid down. In addition the yards are overhauling the liner France and making repairs to numerous merchant steamers. The foregoing tonnage will be augmented shortly by the laying of the keel for the Verdun, the new French passenger steamer for the North Atlantic service. The Verdun will be a 40,000-ton vessel and will be driven by four Parsons turbines of a total of 50,000 hp. Apart from the hull work the Penhoet shops are building steam and Diesel engines for both naval and commercial vessels, and one turbine contract involves 112,000 hp. for a cruiser of 8000 tons.

The Loire shops laid down at St. Nazaire during the past 10 days the keel for a new Netherlands passenger steamer of 22,000 tons, and the contract calls for delivery in 20 months. This vessel will be driven by two Diesel engines of the 4-cylinder, 2-stroke Sulzer type. The new steamer is designed for the Indo-China trade, and will carry cargo as well as passengers.

The St. Nazaire shops of the Loire works have in hand the turbine engines for the French cruiser Duguay Frères, totaling 100,000 hp. Parsons turbines will be installed on a basis of 25,000 hp. per shaft. There are 4 screws. The vessel's displacement is 8000 tons. A speed of 35 knots is expected.

Wages Close to $1 a Day

Ship fitters are earning along the Loire from 16 to 17 francs per day. In the shops good men at the tools and at erecting work receive as high as 20 francs per day, and when overtime is involved, very frequently 25 to 26 francs.

The Loire shipyards are drawing all of their forgings from French steel works and are doing relatively little foundry work on their own account. There have been comparatively few new tools installed since the close of the war, and such tools as are in service are for the most part of English or Scotch origin.

Three months ago these same yards were practically without work save for locomotive repairing. The Loire yards have a contract now with the French state railroads to repair 1000 locomotives. The contract is a running one to extend over the next ten years. The average cost of repair for a Baldwin locomotive, fitted with copper fire boxes, is 112,000 francs. This covers reboring of cylinders, rectification of moving parts, lining up, and turning down of driving wheels where necessary. The locomotives so repaired are deemed fit for 15 years' more service. In turning down the tires of American locomotives the French workmen often break their tools, I was told, owing to the presence of hard spots in the steel. This seldom happens, it was declared, when turning down French tires.

The Penhoet shops are also undertaking some special aeroplane construction for the government and are building Diesel engines for submarines. The two naval vessels on the stocks, the Chaeal of 2400 tons and the Simoun of 1455 tons, represent the latest French designs for torpedo destroyers. An interesting comparison is afforded here with the 900-1200 tons types in the United States service. The trend among French naval architects is all in the direction of increased tonnage for vessels of whatever class in which speed is an important factor.

National Metal Trades Association Will Celebrate at New York Meeting

The twenty-sixth annual convention of the National Metal Trades Association to be held at the Hotel Astor, New York, Wednesday and Thursday, April 23 and 24, marks the rounding out of a quarter of a century of constructive achievement by that organization. An unusually attractive program will be carried out. At the meeting Wednesday morning the following presidents will speak briefly on the achievements of the association:

H. N. Covell (president, 1903-4-5), Lidgerwood Mfg. Co., Brooklyn.

F. K. Copeland (president, 1908-9), Sullivan Machinery Co., Chicago.

Henry D. Sharpe (president, 1912-13), Brown & Sharpe Mfg. Co., Providence, R. I.

Herbert H. Rice (president, 1914-15), Cadillac Motor Car Co., Detroit.

At the Wednesday afternoon session, the following program will be carried out:

"Industrial Training from a Practical Viewpoint"—John C. Spence, Norton Co., Worcester, Mass.; Thomas C. Shipley, York Mfg. Co., York, Pa.; George P. Aborn, Worthington Pump & Machine Corporation, East Cambridge, Mass.

"The Farmer of Tomorrow"—L. J. Taber, Master of the National Grange.

"Present-Day Conditions in Russia"—Count Ilya Tolstoy.

"Industrial Freedom"—Rev. Marion D. Shutter, Church of the Redeemer, Minneapolis, Minn.

The annual dinner will be held at 7 o'clock, when S. K. Ratcliffe, who began his newspaper career in London 25 years ago on the same evening journal which gave Ramsay MacDonald, the English Premier, his first start a few years earlier, will speak on "The New Order in England—MacDonald and His Government." Mr. Ratcliffe's acquaintance with the Prime Minister goes back to MacDonald's first years in Parliament. Mr. Ratcliffe has followed MacDonald's career closely and has been as near to the personalities and activities of most of the members of the new Labor Cabinet.

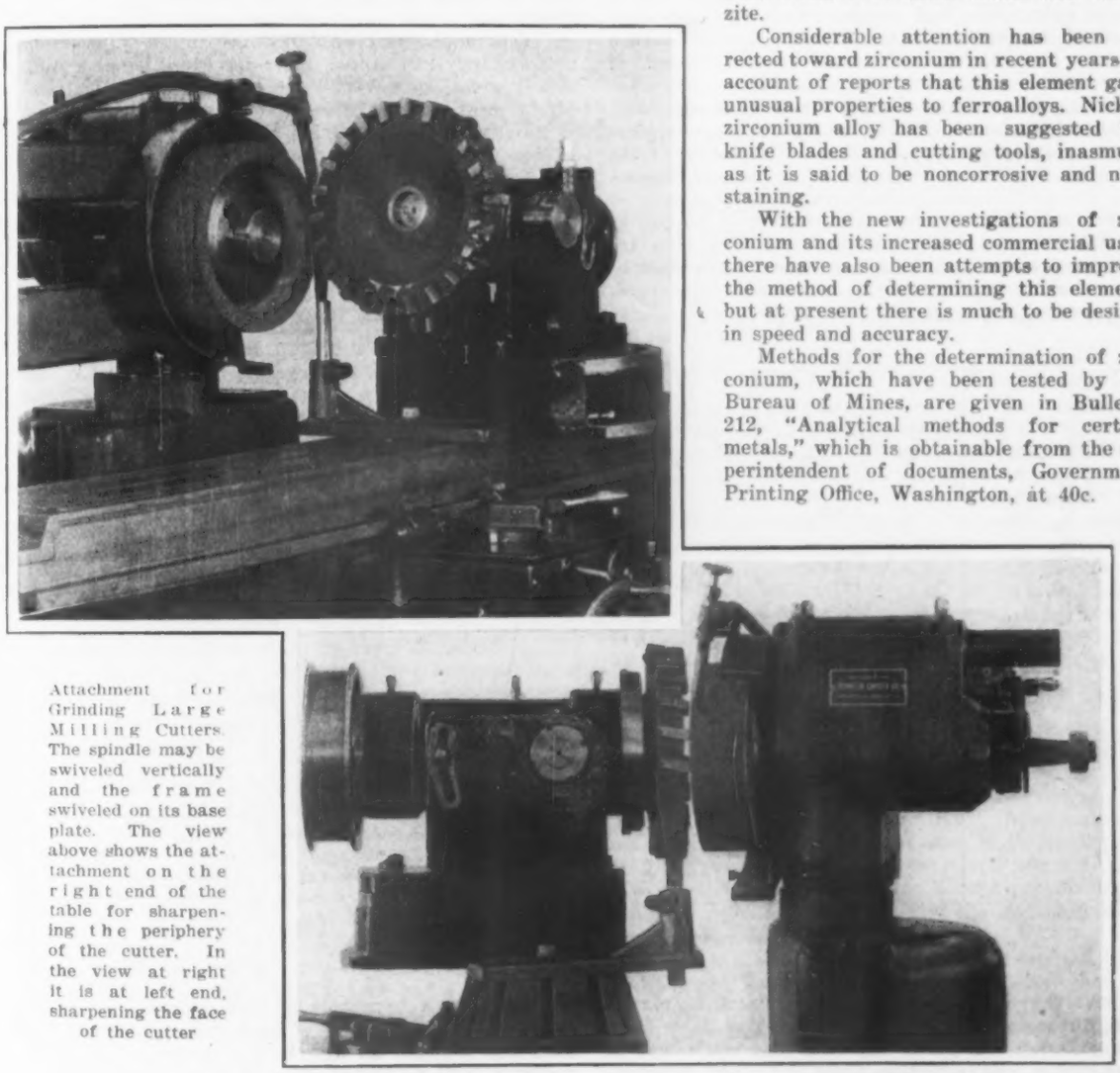
Thursday morning, "The Physician in Industry" will be the topic. Addresses will be made by Dr. John J. Moorehead, professor of surgery, New York Post Graduate Medical School and Hospital, and Dr. W. I. Clark, the Norton Co., Worcester, Mass. The discussion will be led by Dr. O. P. Geier, Cincinnati Milling Machine Co., Cincinnati, Ohio.

The auction sale of metal scrap from the U. S. S. South Carolina, covering 8300 tons of steel, 3700 tons of armor and 250 tons of non-ferrous material, scheduled for April 8 at the Navy Yard at Philadelphia, has been postponed to April 24.

Universal Workhead for Tool and Cutter Grinding Machine

The special 22-in. swing headstock illustrated, for use in grinding large milling cutters, has been placed on the market by the Thompson Grinder Co., Springfield, Ohio, being offered as a standard feature for its 10 x 36 in. universal tool and cutter grinding machine.

The general arrangement of the attachment may be noted from the illustrations, which show the set up for sharpening the face and periphery, respectively, of a milling cutter. The headstock spindle is mounted on roller bearings in a frame, and is arranged to swivel perpendicularly through an arc of 30 deg. The frame has a 90 deg. swivel on its baseplate, which is mounted directly on the table of the machine, thus making it possible to obtain any position or angle of clearance.



Attachment for Grinding Large Milling Cutters. The spindle may be swiveled vertically and the frame swiveled on its base plate. The view above shows the attachment on the right end of the table for sharpening the periphery of the cutter. In the view at right it is at left end, sharpening the face of the cutter

The spindle is 5-in. in diameter, is pack hardened and ground, and is provided with a 10-in. slotted flange to correspond to the flange on the milling machine spindle. It is fitted with a No. 16 B & S taper hole, or other size to suit requirements, and collets may be used to bush down to smaller sizes of cutter shank. The cutter itself is bolted directly to the flange in the same position as held on the milling machine spindle. The pulley on the rear end of the spindle may be belted to the drum shaft for cylindrical grinding, if desired.

The attachment may be mounted on either end of the grinder table to accommodate either right or left-hand cutters, the universal swivelling feature permitting of sharpening the cutter on the face and periphery without removing it from the attachment. A cup wheel is used so as to obtain straight angle clearance.

New Investigations of Zirconium

Zirconium occurs mainly in two minerals, baddeleyite and zircon, according to Bulletin 212, recently issued by the Department of the Interior, through the Bureau of Mines. Most of the baddleyite ore is found at Sao Paulo, Brazil. It is sold in this country in a natural mixture with zircon, under the trade name of zirkite, and contains about 75 per cent zirconium dioxide. In this country a deposit of zircon sand has been located at Pablo Beach, Fla., and as much as 3 per cent of some of the auriferous sands of Idaho and other States have been found to be zircon mixed with monazite.

Considerable attention has been directed toward zirconium in recent years on account of reports that this element gave unusual properties to ferroalloys. Nickel-zirconium alloy has been suggested for knife blades and cutting tools, inasmuch as it is said to be noncorrosive and nonstaining.

With the new investigations of zirconium and its increased commercial uses, there have also been attempts to improve the method of determining this element, but at present there is much to be desired in speed and accuracy.

Methods for the determination of zirconium, which have been tested by the Bureau of Mines, are given in Bulletin 212, "Analytical methods for certain metals," which is obtainable from the superintendent of documents, Government Printing Office, Washington, at 40c.

Temperatures in Blast Furnaces Using Charcoal

A study of temperatures in blast furnaces using charcoal as fuel has been completed by Department of Interior engineers at the Minneapolis Experiment Station of the Bureau of Mines. The temperature data on smelting charcoal iron were needed chiefly for comparison in the general study of blast furnace problems. It was found that the temperatures under which charcoal furnaces are operated are lower than is permissible in coke practice. Furthermore, it was learned that the principal factor in causing this difference is the low sulphur content of the charcoal compared with the higher quantity of sulphur present in coke. In fact, the effect of sulphur in the blast furnace charge is even more important than was hitherto believed.

Behavior of Metals Under Compression

Tests Show That Rate of Flow Increases with Load Up to a Peak, Then Diminishes—Non-Ferrous Metals Studied

BY H. I. COE*

COMPRESSIVE stresses are involved so frequently in the working of metals and in their application in the form of finished material that it is a matter of some surprise to find comparatively few published records of observations of the strains produced by such stresses. The behavior of metals in compression is closely related to their behavior in tension over a range of stresses up to the maximum stress in tension and, in general terms, is similar, though the dimensional changes possess an opposite sign. The study of the strains produced in ductile metals up to and slightly above the yield point under tensile stress is easy in practice, but under compressive stress it is less so, as it is difficult to keep long bars straight when they are under compression and, as a rule experiments must be made on short specimens, and consequently measurements become proportionately less precise.

Above the yield point, in the semi-plastic or plastic range, dimensional changes can be studied more fully in compression test pieces as, at a load equivalent to the maximum load in tension, there is no local deformation corresponding to "necking" in tension; on the other hand, the barrel-shaped distortion that occurs introduces an uncertainty in the expression of load per unit area of the increased cross section of the compressed specimen. It appears usual to measure the diameter at the maximum of the barreled section.

Valuable information concerning the plastic flow of metals under stress is given by Unwin, who quotes Tresca as follows: "For all bodies two distinct periods are recognized: the period of perfect elasticity, which corresponds to variations of length proportional to the forces applied; and the period of imperfect elasticity, during which, on the contrary, the changes of dimension increase more rapidly than the forces producing them. If the second phase of deformation be alone considered, it is easily understood that it tends toward an ultimate condition in which a given force, sufficiently great, would continue to produce deformation, without limit—as may be observed in the process of drawing lead wire.

"This particular condition, in which the deformation is indefinitely augmented under the operation of a sufficiently great force, constitutes in fact the geometrical definition of a third period, that of fluidity. The period of fluidity is more extended for plastic substances: it is more restricted, and will even disappear altogether, for some vitreous or brittle substances. But it is perfectly developed and extremely extended in the case of clays and of the most malleable metals."

Unwin states: "When very ductile materials are loaded with pressures which approach or reach the pressure of fluidity, the strains follow approximately the plastic law, and the stress-and-strain curve becomes nearly a hyperbola." Stress-strain curves are given for short cylinders of lead, copper and wrought iron, and indicate an approach to a perfectly plastic condition, and an examination of them shows that, in general, they are smooth in character.

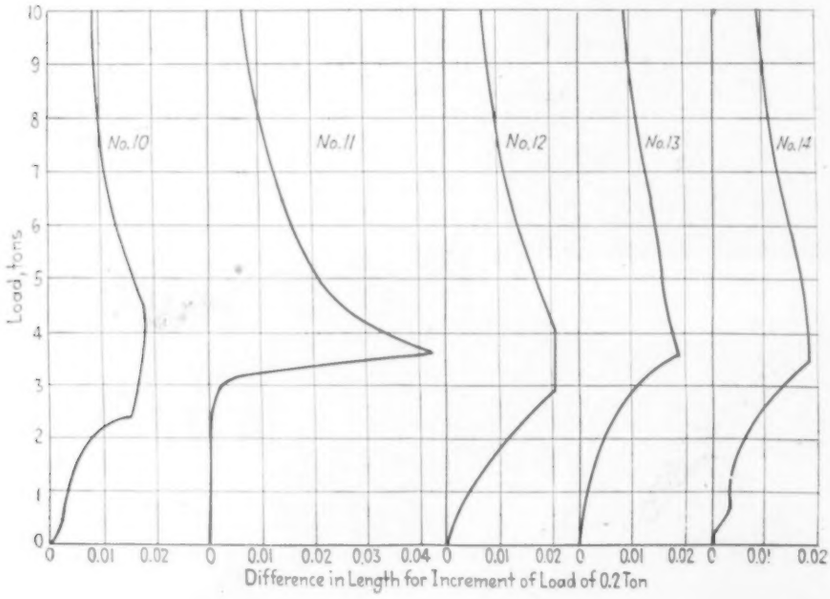


Fig. 1—Compression Tests on Aluminum, Showing Differences in Length, in Fractions of an Inch, for Load Increments of 0.2 Ton

Present Work

A 10-ton Buckton testing machine was employed for the application of loads to the test pieces, which were in the form of cylinders 1 in. long and, with a few exceptions, ¾ in. diameter. Pressure was applied through polished hardened steel compression plates which were backed with thin sheet lead, by means of which true parallelism of their faces could be insured. With certain exceptions, loads were applied in steps of 0.2 ton for a period of one minute; after the application of a load the specimen was removed, length and diameter were measured by micrometer gages to 1/1000 in., the specimen replaced, turned on its axis through an angle of 90 deg., and the next higher load applied.

It was found that in many cases measurements of length indicated a permanent set at a considerably

*University College of Swansea, Wales. Portion of a paper before the (British) Institute of Metals.

Table I.—Tests in Compression and in Tension

Material	No.	Treatment	Compression: Elastic Limit	Compression: Stress Giving Critical Plasticity, Tons per Sq. In., On Initial Section	Compression: Stress Giving Critical Plasticity, Tons per Sq. In., On Enlarged Section	Compression: Reduction in Length at Load Giving Critical Plasticity, Per Cent	Compression: Reduction in Length Under 10-Ton Load, Per Cent	Tension: Tons per Sq. In., Elastic Limit	Tension: Tons per Sq. In., Yield Point	Tension: Tons per Sq. In., Maximum Load	Tension: Elongation on Length = 4√A, Per Cent	Tension: Reduction of Area, Per Cent	Brinell Hardness, Number	Density Corrected to Water at 4 Deg. C. = 1
Aluminum	10	Chill-cast	...	5.6	5.16	6.5	56.9	...	...	...	...	...	22	...
	11	¾ in. extruded and drawn	4.5	8.2	7.40	8.2	58.1	...	...	...	...	...	29	2.7059
	12	¾ in. do. annealed 550 deg. C.	...	6.6	6.41	13.3	58.4	...	...	...	...	...	17.5	2.7073
	13	1 in. extruded	0.4	8.3	7.00	11.6	50.4	1.1	6.4	7.02	37.6	73.0	26	...
	14	1 in. do. annealed 550 deg. C.	0.4	7.7	6.50	19.1	52.3	1.1	5.9	6.44	38.3	74.4	24	...
Copper	17	Chill-cast	0.45	12.7	10.64	17.4	35.6	...	...	...	...	...	34	7.95 (unsound)
	18	Slow cooled	0.45	12.9	11.10	12.5	30.3	...	...	...	...	...	38	8.639
	19	Hard drawn	11.0	22.5	20.30	7.5	9.6	8.5	19.0	20.7	14.0	56.0	89	8.903
	20	Annealed 320 deg. C.	3.7	19.8	14.53	12.2	18.1	4.0	10.0	16.5	41.0	64.6	67	...
	21	Annealed 580 deg. C.	1.2	18.4	14.96	16.6	23.6	4.0	6.5	15.0	56.4	67.0	51.5	...
	22	Annealed 800 deg. C.	0.6	15.8	13.32	13.4	24.0	0.5	5.0	14.5	61.8	64.7	47.5	...
Iron	23	Annealed 1050 deg. C.	8.0	...	not clear	...	...	9.2	10.4	20.0	35.0	(?)70.0	86	...
Nickel	24	Annealed 760 deg. C.	7.2	...	not clear	...	...	8.4	10.9	30.8	44.5	55.0	123	...

lower load than was indicated by the measurement of diameter; it is thought that this permanent set was due to imperfections in the machining of the cylinders, and that the first permanent increase in diameter affords a truer indication of the elastic limit of the material having been exceeded. With Armco iron, for example, the permanent set indicated by measurement of diameter agreed with the permanent set in tension, whereas the permanent set as indicated by measurement of length in some cases did so, but in other cases occurred at a considerably lower load. Measurements of diameter are reliable except at high loads, under which, in some cases, the sides became rough and irregular.

Where reference is made to tests on metals in the chill-cast condition, the cylinders had been prepared from the bottom end of ingots 3 in. long by 1 in. diameter, obtained by casting in an iron mold with walls ¾ in. thick. Stresses per sq. in., where given, are calculated on the mean of the cross-sectional areas of the specimens before and after the application of the load concerned. Tensile test pieces were prepared and tested over a parallel length of 4½ in.; loads were applied in steps similar to those for the corresponding compression test pieces, and were taken off prior to measurement, which was made by dividers for length, and a micrometer gage for diameter. Percentage elongation was determined on a length equal to 4 √ (area.)

Brinell hardness tests were carried out with the use of a ball 10 mm. (0.39 in.) diameter and a load of 1000 kg. (2205 lb.) applied for one minute, except in the case of tin and lead, for which it was 200 kg., (441 lb.) and iron and nickel, for which it was 3000 kg. (6614 lb.).

Results of Tests

Results of tests in compression are represented graphically; an examination of most of the curves will show that the rate of flow, as measured by the change in length of the cylinders, increases with increase in load, after the elastic limits and yield points of the metals have been exceeded, up to a maximum which is represented either by a peak, or by an inflection in the curves, and that subsequently the rate of flow tends to diminish. The stresses per sq. in. on the initial sections of the cylinders, and the stresses per sq. in. on the mean of the cross-sectional areas immediately preceding and after the application of the actual load corresponding to the peak or inflection in each curve, have been calculated. The results are given in Table I under the headings "Stress giving critical plasticity, etc." The term "critical plasticity" has been used conveniently to describe an abnormal change in the degree of plasticity which, according to the present experiments, most metals exhibit at a particular load. Load-increase in diameter curves drawn were similar in shape to the load-decrease in length curves which are reproduced. The results of tensile tests and determinations of hardness and density for a number of the metals considered are given in Table I.

The tests on each metal will be discussed briefly. [Aluminum, copper, iron and nickel, only. Tin, lead, zinc, antimony and silver omitted.—Editor.]

Aluminum.—Cast aluminum (99.2 per cent Al);

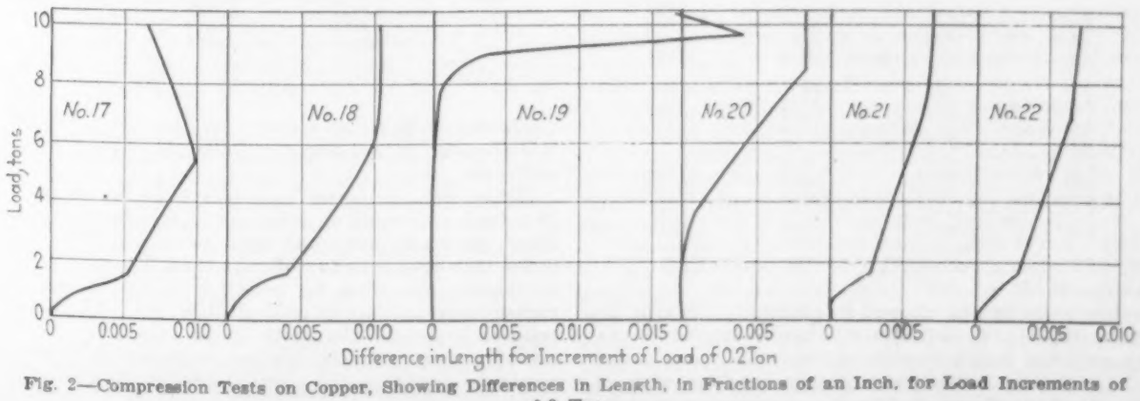


Fig. 2—Compression Tests on Copper, Showing Differences in Length, in Fractions of an Inch, for Load Increments of 0.2 Ton

Fig. 1, curve No. 10. Extruded and drawn aluminum (99.6 per cent Al) was supplied in the form of a ¾-in. diameter bar by the British Aluminum Co. Samples from the bar were tested in the "as received" condition, and after annealing for 30 minutes at 550 deg. C., or 1022 deg. Fahr. (Tests and curves Nos. 11 and 12.)

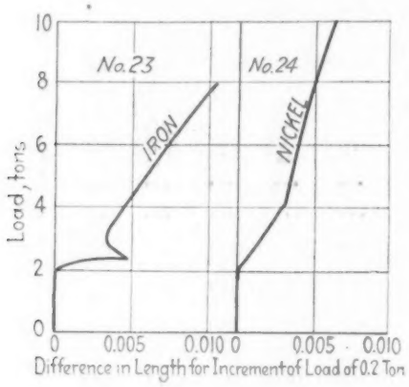


Fig. 4—Compression Tests on Iron and Nickel, Showing Differences in Fractions of an Inch, in Length, for Load Increments of 0.2 Ton

Another bar, 1 in. diameter, of extruded aluminum (99.2 per cent Al) was tested, after machining to ¾-in. diameter, under similar conditions. (Tests and curves Nos. 13 and 14.) It will be noted that the Brinell hardness numbers are not in good agreement with the amount of deformation undergone by the respective cylinders under the application of a 10-ton load, as indicated in Table I.

Copper.—(a) Chill cast; electrolytic copper melted and deoxidized with potassium cyanide (Fig. 2, curve 17.) Many points lay rather badly off the curve, but the peak corresponding to critical plasticity was nevertheless well defined. At a lower load of about 1.6 ton an inflection in the curve appeared to indicate the termination of what may be regarded as a yield range. The determination of the density of the cylinder proved the casting to have been unsound; hence, probably, the erratic measurements given for length and diameter during test and the low hardness value.

(b) Slow cooled; electrolytic copper melted under barium chloride and allowed to solidify in the crucible. Curve 18, Fig. 2, indicates a behavior similar to cast copper when tested in compression.

(c) Drawn electrolytic copper in the form of ¾-in. diameter bar. Curve 19, Fig. 2, is noteworthy as showing a relatively large temporary yield under compression at a load of about 9.8 tons.

(d) Drawn copper bar annealed at 320 deg. for 30 minutes; curve 20, Fig. 2.

(e) Drawn copper bar annealed at 580 deg. for 30 minutes; curve 21, Fig. 2.

(f) Drawn copper bar annealed at 800 deg. for 30 minutes; curve 22, Fig. 2.

All three curves show inflections at different loads, the point of inflection tending to become less distinct with the higher annealing temperatures. Curves 21 and 22 show yield ranges similar to those displayed by cast and slow-cooled copper, and terminating at the same load, equivalent to a stress of about 3.7 tons per sq. in., calculated on the original area of cross section of the cylinder. Tensile tests were made on the drawn bar in the "as received" condition, and after annealing at 320, 580 and 800 deg. C., the specimens being machined to give a parallel length of 0.505 in. diameter.

These tests were carried out in the manner previously indicated, and load-differences in diameter curves are reproduced in Fig. 3, curves Nos. 19a to 22a. Curves 21a and 22a indicate the presence of a yield range in well-annealed copper, though the range of stresses does not agree with that shown in the compression tests. Further tests in compression were made on cylinders machined from the drawn bar to 0.505 in. diameter and annealed at 320, 580 and 800 deg. C., in order that the results could be compared with those from the tensile tests. The curves embodying the data obtained are not reproduced, as they were practically identical in general shape with those of curves 19 to 22, and calculated values of stresses giving critical plasticity also agreed well.

Iron, Nickel.—Armco iron annealed at 1050 deg. C. (1922 deg. Fahr.) Fig. 4, curve 23. Bar (99.7 per cent Ni) annealed at 760 deg. C., (1400 deg. Fahr.) Fig. 4, curve 24.

Tests were made on cylinders 0.554 in. diameter. In neither case could an inflection be found in the curve after the yield point had been exceeded. Iron and nickel thus appear to be different from the other metals considered, and show no inflection in their plasticity curves corresponding to critical plasticity. The author believes it possible that with larger cylinders, and the use of a more powerful testing machine, an inflection would be found in the curves obtained from similar tests.

Table II.—Partial Results of Test in Compression on Cylinder No. 12, Drawn Aluminum, Annealed at 550 Deg. C. (1022 Deg. Fahr.) for 30 Min.

Load, Gross Tons	Length, In.	Diameter, In.	Stress on Enlarged Section, Tons per Sq. In.
2.0	0.9410	0.7774	.....
2.2	0.9290	0.7834	4.590
2.4	0.9139	0.7912	4.918
2.6	0.8969	0.8000	5.221
2.8	0.8768	0.8103	5.490
3.0	0.8568	0.8216	5.727
3.2	0.8359	0.8327	5.937
3.4	0.8150	0.8450	6.137
3.6	0.7950	0.8565	6.327
3.8	0.7746	0.8690	6.490
4.0	0.7538	0.8814	6.639
4.2	0.7345	0.8940	6.774
4.4	0.7160	0.9060	6.918
4.6	0.6975	0.9182	7.055
4.8	0.6796	0.9310	7.164
5.0	0.6633	0.9432	7.269
5.2	0.6475	0.9547	7.337
5.4	0.6316	0.9662	7.459
5.6	0.6168	0.9782	7.552
5.8	0.6025	0.9904	7.612
6.0	0.5895	1.0008	7.643

Table III

	Aluminum No. 13	Aluminum No. 14	Copper No. 19	Copper No. 20	Copper No. 21	Copper No. 22
Stress giving critical plasticity, gross tons per sq. in., on enlarged section	7.00	6.50	20.30	14.53	14.96	13.32
Maximum load in tension, tons per sq. in.	7.02	6.44	20.7	16.5	15.0	14.5

Table IV.—Partial Results of Test in Compression on Cylinder No. 18, Slow-Cooled Copper

Load, Gross Tons	Length, In.	Diameter, In.	Stress on Enlarged Section, Tons per Sq. In.
4.6	0.9088	0.7904	.....
4.8	0.9022	0.7934	9.726
5.0	0.8956	0.7966	10.050
5.2	0.8888	0.8000	10.369
5.4	0.8817	0.8036	10.682
5.6	0.8740	0.8086	10.947
5.8	0.8666	0.8124	11.219
6.0	0.8594	0.8151	11.527
6.2	0.8517	0.8190	11.821
6.4	0.8439	0.8230	12.076
6.6	0.8359	0.8271	12.313
6.8	0.8279	0.8313	12.558
7.0	0.8200	0.8356	12.797

With the exception of tin and lead, the metals do not become truly plastic over the range of loads employed in the experiments. The most striking feature brought out is the close agreement of the values for stresses giving critical plasticity calculated on the enlarged cross-sectional area of the cylinders, and the occur during the flow of metals under compressive stresses, but he believes that the results of the experiments will be of assistance in its interpretation. He desires, however, to emphasize the marked difference in the behavior of worked and annealed metals as illustrated by the cases of aluminum, silver and copper.

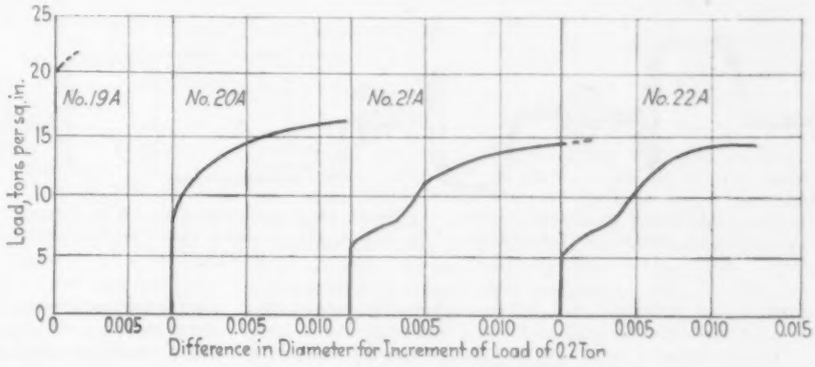


Fig. 3 — Tensile Tests on Copper, Showing Differences in Diameter, in Fractions of an Inch, for Load Increments of 0.2 Ton

values for the maximum load in tension of the same material. These values are brought together in Table III, in which the reference numbers are to Table I.

Conclusion

The author does not feel inclined at the present time to enter into a theoretical discussion of the mechanism of the changes which have been found to

Worked metals, though very resistant to compressive stresses up to a certain relatively high load, appear to collapse suddenly, subsequently recovering to a certain extent their power of resistance to those stresses. The case of aluminum is interesting, as indicating that under high loads (10 tons for cylinders ¾ in. diameter) the deformation is approximately the same, whatever the initial condition of the metal.

Large Electrical Reversing Rolling Mill Drive

Belgian Rail Mill Uses Flywheels Running at 5¼ Miles per Minute to Smooth the Energy Curve

DETAILS of a reversing rolling mill which has been in continuous operation since March, 1922, in the plant of the Société Anonyme des Aciéries d'Angleur, Liége, Belgium, are given in a recent number of the *Iron and Coal Trades Review*. The rolling plant comprises a combined blooming and finishing mill consisting of four stands (one blooming and three finishing), with a mean roll diameter of 950 mm. (37½ in.)

The material chiefly dealt with is hard steel, having an ultimate tensile strength of about 67.5 kg. per sq. mm. (96,000 lb. per sq. in). The rolling temperature is 1150 to 1000 deg. C. (2100 to 1830 deg. Fahr.) The ingots have a mean cross section of 500 x 500 mm. (20 x 20 in.) a length of about 64 in., and an average weight of about 3 tons.

From the re-heating furnace the heated ingots are passed to the blooming rolls, where they are reduced in cross section to 6 x 6 in. The blooms are then passed through the finishing rolls, where rails for tramways or railroads are produced. The shapes assumed by the cross section of a tramway rail weighing 47 kg. per meter-run (say 95 lb. per yard), during the process of rolling from an ingot of about 6300 lb., are shown in Fig. 1.

The mill is so arranged that, if necessary, the blooming and finishing rolls can later be disconnected from each other. In this case, the latter would be driven by a separate reversing motor. Three-phase 6000-volt, 50-cycle current is used.

Current goes to the two driving motors of the flywheel motor-generator set. This consists of two symmetrical parts, each made up of one 3-phase induction motor of 2100 kw., 6000 volt, two direct-current generators, each of 1560 kw. continuous output at 460 volts, and a 30-ton flywheel. The two parts are connected by a flexible coupling. The synchronous speed of the motor-generator is 750 r.p.m. In view of the subsequent separation of the blooming from the finishing mill, space was left in each half of the set for a third d.c. generator.

The flywheels keep from alternating-current mains the great fluctuations of energy arising from the rolling process. They consist of steel castings and, on account of the high peripheral speed of 141 meters (462 ft.) per second (5¼ miles per min.), which corresponds to the maximum working speed of 750 r.p.m., they were cast as solid disks—i.e., without coring out the boss. The shafts are secured to the flywheels by means of special coupling flanges cast on the latter.

During the machining process, the flywheels were several times heated to redness, to remove all internal stresses, and afterward balanced both statically and dynamically to insure perfect running, and finally subjected to an over-speed test of 10 per cent above the maximum working speed. The flywheel bearings, which are water cooled, have only ring lubrication. Dial thermometers, which operate contacts and signals, control the temperature of the bearings. That the motor-generator set may be brought to rest quickly, each flywheel has a hand-operated brake.

The d.c. machines are connected to the flywheels, and the two flywheels to each other, by means of flexible cast steel couplings with easily interchangeable, leather-cushioned bolts, which fit into conical holes in one half of the coupling, and which are supplied with special gear for withdrawing them quickly.

The reversing-mill motor is supplied with current on the Ward-Leonard system from two or three of the d.c. generators connected in series. Each of these can be disconnected from the circuit by a special change-over switch so that, in the event of damage to one of the generators, the output can be maintained to a certain extent, if not fully. The irregularity in the demand on the rolling-mill motor, and the frequent reversal of the

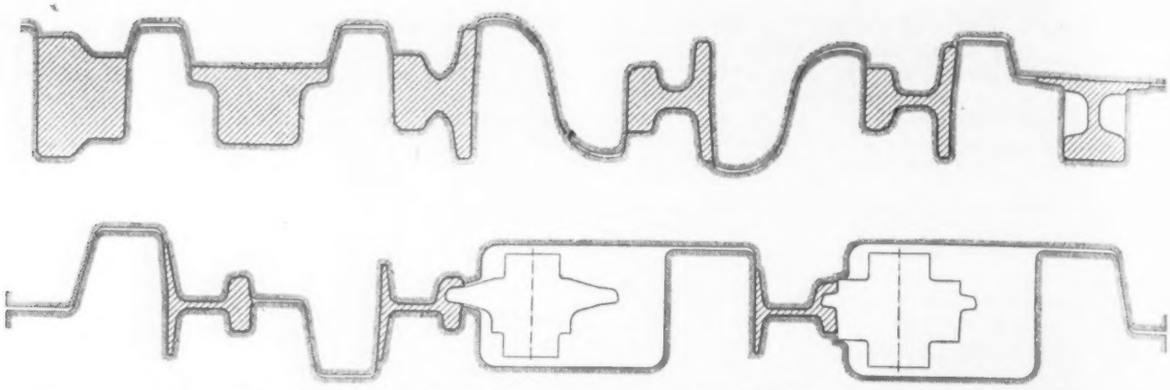


Fig. 1—Changes in Cross Section of a Steel Railroad Rail of 95 Lb. per Yard, During the Rolling Process. The upper view shows the blooming mill; the lower, the finishing mill. In both cases the top roll is above; the lower roll, below

direction of rotation, call for exceptionally robust design, in both mechanical and electrical respects.

In the present case a motor with a double armature is employed, owing to the large output and torque required. This motor can develop a maximum torque of 215 ton-meters (about 700 ft.-tons) at any speed between 0 and ± 60 r.p.m. Should this torque be exceeded, the motor is automatically cut out. The torque corresponding to the continuous rated output of the machine is about 30 per cent of this value. The maximum torque required for rolling rails is about 2 to 2½ times the normal full-load torque, and the fact that the motor is not cut out, owing to overload when an exceptionally cold ingot is rolled, shows that an ample margin exists.

Speed is regulated between 0 and 60 r.p.m. by adjusting the pressure of the generators, and it can be raised from 60 to 150 r.p.m. by weakening the motor field, with a corresponding decrease in the torque. The regulation of the generator pressure, and thus of the speed, is carried out indirectly by altering the fields of the exciters.

Special devices employed on this plant to fulfill the requirements of rolling-mill drives include:

1. Counter-compound winding of the d.-c. generators, which has as its object the damping of current surges arising at starting and reversing.

2. The design of the exciters allows great flexibility of generator control. The retarding effect due to the

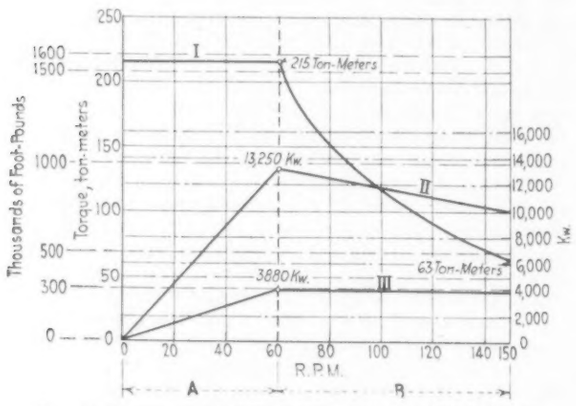


Fig. 2—Torque and Power Curves of the Mill Drive in Rolling Down a 6300-Lb. Ingot Into a 95-Lb. per Yard Rail. The maximum torque of 215 ton-meters can be maintained at any speed up to 60 r.p.m. At continuous rated output, at 150 r.p.m., the corresponding torque is 63 ton-meters. Curve I shows the maximum torque; curve II, that for rolling rails; curve III, the normal rolling torque

self-induction of the generator field is thereby reduced, so that the speed of the motor follows practically instantaneously every movement of the control lever.

3. The overload release consists of two over-current relays connected as a shunt on the main circuit. With a current of 11,000 amp.—*i.e.*, 3.2 times normal full-load current—the circuit of an electromagnet in the controller is broken, and the contact gear is released from the control lever, and automatically returns to the "off" position. This brings the excitation of the generator back to zero, thus stopping the main motor. Should the current rise to 11,600 amp.—*i.e.*, 3.4 times full-load current—an emergency switch, which cuts out the excitation of both the generators and the main motor, is operated by the second over-current relay, thereby bringing the latter to rest.

4. The automatic slip-regulating device, which controls automatically the slip of the driving motors of the motor-generator set. The slip can be increased up to a maximum of 20 per cent, to enable the energy stored in the rotating masses to be used.

Cleveland Meeting of Mechanical Engineers

The technical program of the spring meeting of the American Society of Mechanical Engineers, to be held at Cleveland, May 26 to 29, has a number of outstanding features. W. L. R. Emmet will make his first formal presentation of his development of the Mercury vapor process. There will be a joint session with the American Society for Testing Materials on the properties of materials at high and low temperatures. This is of great importance at the present time because of the trend toward higher temperatures in steam power plant practice and in the oil refinery. The machine shop practice division is holding two sessions at one of which A. L. DeLeeuw will present a paper giving the analysis of a machine shop problem on a quantity and final economy basis. The management division will continue the discussion on the measurement of management which was instituted by the presentation of a paper by Prof. Joseph W. Roe during management week last October.

The technical program includes the following:

Conference on Industrial Education.

Power Problems of Steel Industry: General Power Problems, Bryant Bannister. Steam Problems, John A. Hunter. Use of Gas Engine in Steel Works, A. E. Danks.

Materials Handling in Industrial Plants: Economics of Material Handling, M. L. Begeman. Continuous Assembly of Automobiles, M. R. Denison.

Windmill and Fan Design: Performance of Centrifugal Fans for Electrical Machinery, C. J. Fechheimer. Wind Power, F. J. Pancratz.

British Machine-Tool Design, W. E. Sykes.

Determination of Heat Losses Through Insulating Material, R. H. Heilman.

War's Impress on the Steel Industry, A. E. White.

Public Hearing on Power Test Codes, Condensers and Gas Producers.

Materials at High and Low Temperatures: Industrial Application of Metals at Various Temperatures, L. W. Spring. Methods of Testing at Various Temperatures and Their Limitation, V. T. Malcolm. Available Data on the Properties of Irons and Steels at Various Temperatures, H. J. French. Available Data on the Properties of Non-Ferrous Metals, A. E. White and H. W. Uptegrove.

Maurice M. Osborne, Petroleum Heat & Power Co., gave an illustrated talk Thursday evening, March 20, at the Engineers' Club, Boston, before the Boston section American Society of Mechanical Engineers, on domestic oil burners from an engineering standpoint.

Basic Production Continues on High Level

Past Twelve Months' Average Above 1920 Peak— One-Sixth Higher Than 1919 Average —Some Industries Below Par

BY SIDNEY G. KOON

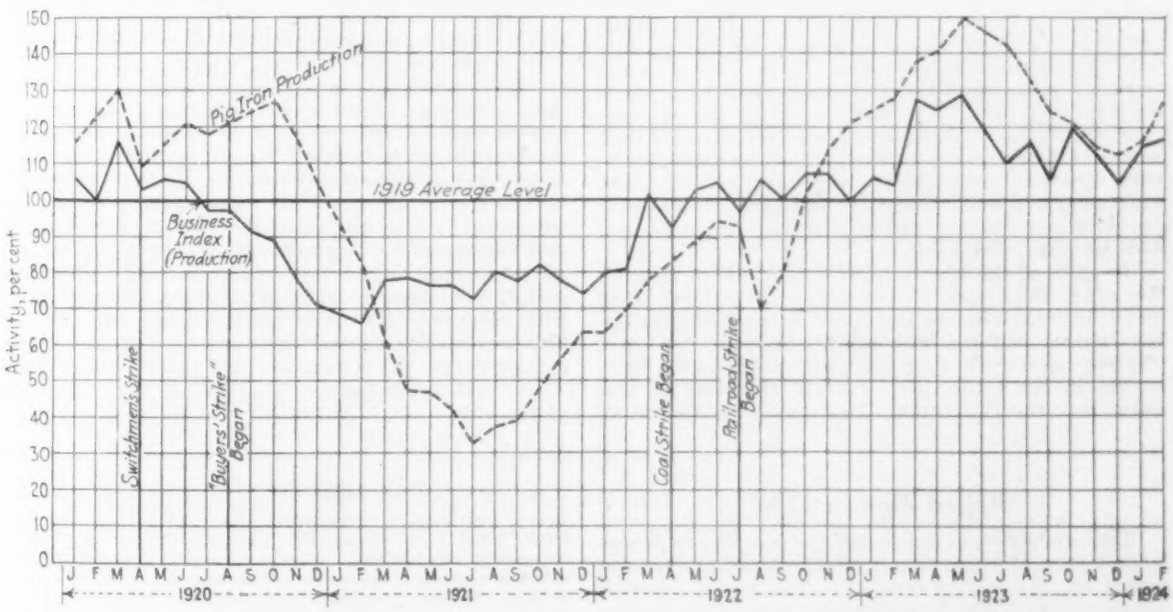
EXCEPTIONALLY heavy production of automobiles, fuels, steel and lumber, together with large building operations and an output of both newsprint paper and non-ferrous metals greater than previous averages, have kept the recent history of production in the United States at the highest level ever sustained. Some industries have languished, notably textiles and leather, while there has been recently a decided falling off in food production. Nevertheless, the general average has remained continuously above the 1919 level ever since the settlement of the coal strike in the summer of 1922. Building figures, long impressive in dollars because of high construction costs, have advanced in footage through the winter to levels considerably above those of the late summer. Ingot production is higher than ever before in history, with the exception of a short period nearly a year ago.

In spite of the high level of production, complaints are heard of a lack of profits. Some industries are hurt because of scant foreign outlets. The oil investigation at Washington is not helping. Recent curtailment of production in the copper fields is cutting into the non-ferrous line, which has dropped from an index of 123 in November to 113 in February. Nevertheless, not since June has the non-ferrous index been below 100.

Expanding purchasing power of the American people is almost wholly responsible for the high position of manufacturing production today. Foreign shipments have little effect, except in particular lines, but a continuance of high wages in nearly all industries, coupled with full employment, have maintained a rate of output not before equalled. Easy money at low rates leads to the belief that this condition of high employment and heavy production will continue for months to come.

As explained in previous reviews on this subject, which have been published at intervals during the past two years, the curve of production is based on quantity without reference to prices. Dollars do not enter into it at all. No attempt is made to use a seasonal factor to smooth out the curve, nor is correction made for differing lengths of months. Both these considerations account for some of the local inequalities, month by month, but do not affect the general result. Twenty-one separate items are used in the analysis, in 10 groups, as follows:

1. Food; beef, flour and sugar.
2. Building construction.
3. Textiles; cotton and wool.


Pig Iron Production
1919 Average Level
Business Index (Production)
Activity, per cent
Switchmen's Strike
"Buyers' Strike" Began
Coal Strike Began
Railroad Strike Began
J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F
1920
1921
1922
1923
1924

Productive Activity in the United States Has Maintained for More Than a Year a Higher Average Level Than Has Ever Before Been Reached. As always, the curve of activity in suc h a basic commodity as pig iron shows fluctuations much greater than with manufactured products in general. It is noteworthy that pig iron has indicated a higher level, throughout the year, than the average

4. Fuel; anthracite and bituminous coal and petroleum.
5. Vehicles; automobiles and trucks.
6. Leather; belting and sole leather.
7. Lumber; yellow pine, Douglas fir and Northern hardwood.
8. Steel ingots.
9. Non-ferrous metals; copper, lead and zinc.
10. Newsprint paper.

All figures are expressed in their relation to the average monthly output of the calendar year 1919. Each unit which enters the makeup of the curve represents an element of production, although in some instances, such as in textiles, it registers the consumption of the mills. The separate items under each group are averaged and then the direct average taken of the ten group figures.

Previous to 1923 the highest level we have found was that of March, 1920, with an output 115.7 per cent of the 1919 average. The February figure for this year, with some items estimated, shows 117 per cent, or somewhat higher than the 1920 peak. The average for the twelve months ended with February is 116.6 per cent, the three months of March, April and May last year showing the high average of 126.8 per cent. In only two months subsequent to May has the figure

fallen below 110, these being September and December, with about 105 in each case.

Outlook Clear of Clouds

Capacity production of last spring, taxing the facilities of many plants and pushing railroad car loadings during the summer and all through the fall to heights never before reached, appears to have given way to steady operation at a rate which, while somewhat under the highest, is still substantially above anything previous to 1923. Reports of car loadings in the current months show that they are exceeding even the heavy movement of the same period of last year. Today's indications point to a continuance of a high level of production through the summer and fall.

Increasing population is an element not to be ignored. An addition of five millions of people since 1920 forms, in itself, a not inconsequential market. Most of this addition is native born, though not all of native parentage. Much of it is in the wage-earning group—a group whose average week's wages are estimated to have now 31 per cent greater purchasing power than in 1913. These are, relatively speaking, among our most prosperous people and their high buying capacity means much.

Comparison with Pig Iron

Alongside the curve of productive activity or business index has been placed a curve of pig iron production. This commodity does not directly enter the main curve, its place being taken by steel, which is closer to the final consumer. The fluctuations in the pig iron curve are far more abrupt and of greater intensity than those in the business index curve. Such variations have been observed generally in basic or raw materials, when compared with those more closely associated with everyday consumption, and particularly in comparison with manufactured goods.

In spite of the high rate of production all through the year, the index of commodity prices published month by month by the Bureau of Labor Statistics has been almost uniform, with slightly declining tendency. The average for the year 1923 (compared with a basis of 100 in 1913) was 154. In 1922 this average was 149¼ over the 12 months. The increase in the year's average thus has been less than 4 per cent, and the latest figure reported shows only 152, or less than 2 per cent above the 1922 average.

Unstable Elements Lacking

It has been emphasized repeatedly, both in this series of reviews and elsewhere, that the characteristics of the present production movement differ materially from those of 1920. Banking conditions are exceptionally easy, while four years ago they were increasingly stringent. The Federal Reserve ratio, now more than 88 per cent, was then about 40 per cent. Buying is conservative—too much so to suit many people. Much of it is "hand to mouth," and duplication of orders is practically unknown. Thus there will be no repetition of the epidemic of "cancelitis" prevailing in 1920.

Passage of the months gives stronger reason to believe that the history of this cycle in American business will be unique. Its principal divergence from all preceding cycles lies primarily in its lengthening far beyond the 44-month period heretofore regarded as typical. Already we are 48 months from the beginning of the last major decline, and there are no signs that a new major decline will materialize for many months. And it is noteworthy that this drawing out of the prosperity phase of the cycle is providing the country with a continuance of high earning capacity which should to a degree minimize the effects of whatever depression eventually may follow.

With no evidence of a buyers' strike, and with the probability that a lull in productive activity in later months may be offset in part by large governmental construction projects, which have long been postponed, and by well-considered extensions to plants which have held up their building programs because of present high unit costs, it appears improbable that there will be a real depression for many months. The careful buying on every hand, which has been witnessed for a long period, is evidence of a filling in of current needs but with comparatively little provision for the future. This leaves the needs of the future to be filled by production during the coming months, and places us in an exceptionally satisfactory position for the remainder of the year.

Rolled Zinc in 1923

The production of rolled zinc in the United States made a gain of 4 per cent in 1923 over 1922, when the output was the largest since 1918, the year of greatest production, according to a statement made public by the Department of the Interior through the Geological Survey. Importation of zinc sheets entered for consumption in the United States, which amounted to nearly 7000 tons in 1921, was much less in 1922, and practically stopped in 1923.

Rolled Zinc in the United States in 1922 *and* 1923 *in Pounds*

	1922	1923
Sheet zinc not over 1/10 in. thick	50,203,438	49,179,501
Boiler plate and sheets over 1/10 in. thick	2,229,877	2,294,230
Strip and ribbon zinc	54,585,375	60,192,743
Total rolled zinc	107,018,690	111,666,474
Sheet zinc imported and entered for consumption	831,141	584
Rolled zinc exported	6,433,089	7,463,362
Available for consumption	101,416,742	104,203,696

An English View of the Tin Market

A prominent tin operator and dealer, Carl Ricard, of the firm of Rickard & Freiwald, recently returned to London after a stay in this country of some weeks. *Metal Bulletin*, London, publishes an interview accorded by him during his recent visit on this side.

An excerpt is given below:

He is said to regard the advance in tin as being more than justified (the price at the date of the interview was about £280 per ton for three months). The advance already witnessed was, he stated, not the result of manipulation, but the effects of supply and demand. He saw no prospect of an increase in world output during 1924, while it was quite possible there might be a slight reduction in the Dutch total. The Straits might give a little more, but as a rule higher prices did not stimulate production in Chinese-worked mines, because the more money the Chinese got, the less hard would they work. Mr. Ricard looks for a general increase in consumption. Europe is creeping up slowly but steadily, and this may mean an increase of 500 or 600 tons a month in the deliveries. The British recognition of the Russian Government will make a difference and already Russia has taken some good sized quantities. So far as America is concerned, he did not see any reason for a reduction in consumption there—if anything, there might be a small increase. Taking a broad view and barring any unforeseen circumstances, he could only see an increase in consumption and a small decrease in production. "The world therefore may be faced with a tin shortage."

The Effect of Molten Copper on Wrought Iron

During the past month the Bureau of Standards carried out an unusually interesting test on wrought iron rods employed for stirring copper. The manufacturers of these rods reported that, although they had been tested as to mechanical properties and found to be satisfactory, they proved very unsatisfactory in service. A metallographic examination of the iron after deterioration showed an embrittlement of the material, either caused or accompanied by the intercrystalline penetration of the copper into the iron. An attempt was made to reproduce experimentally the same condition in wrought iron bars of known mechanical properties by heating them in molten copper. Specimens simply immersed in a copper bath showed no structural evidence of embrittlement of the iron by intercrystalline penetration of the copper. However, by repeatedly bending the hot iron rod while immersed in the copper some intercrystalline penetration was obtained, which indicates that this mechanical condition is probably one of the contributing causes of this unusual type of deterioration of the wrought iron.

Low Temperature Reduction of Iron Ore

Direct Processes and the Blast Furnace—Carbon Monoxide as a Factor in Both—Metallurgical, Thermal and Fuel Conditions Compared

BY J. KENT SMITH*

THE philosopher's stone was the ideal which the alchemist of the middle ages dreamed of attaining, though his knowledge was not sufficient to enable him to realize the futility which must accompany its fruition. The dream of the modern metallurgist, thoroughly recognized by him to be an idealistic vision incapable of attainment in the light of knowledge of chemical and physical phenomena amassed during the past two generations, has been the direct extraction, from iron ore of an iron or steel, lending itself to the direct production—by one simple mechanical operation —of one or all of the many thousands of those metallic articles useful to man which require as their premier characteristics great strength and high ductility.

But nature rears an insurmountable barrier before such a goal as this. The only reducing agent with which she presents us, "ready made," so to speak, is carbon. Iron must be reduced at a reasonably high temperature, and iron at any elevated temperature must take up some carbon; the higher the temperature the higher the "saturation" point and the more rapid the speed of penetration.

Obviously if the reduction of an iron oxide be brought about by means of some agent other than carbon which is more avid for oxygen than is iron at some given temperature, and for which metallic iron has no affinity, the product—provided always that a suitable kind of iron mineral be used to commence with—should be dead soft iron.

The Thermit Reaction

An instance, familiar to all industrialists, is to be found in the everyday use of the preparation known as Thermit. Here a simple admixture of iron oxide with finely granulated aluminum in correct proportion has induced in it at some point an intensely hot "spot"; at the temperature of this "spot," chemical reaction between the iron oxide and the aluminum ensues, and the aluminum robs the iron of its oxygen associate. The reaction in this direction gives off large quantities of heat, and hence spreads rapidly throughout the entire mass, raising such mass to so high a temperature as completely to fuse it. The regulus of metal which separates by gravity from the fluid slag is plastic and malleable and can be cast or forged to shape while retaining its ductility. Modifications of its composition can be regulated by suitable admixtures with the original charge.

But such of those reagents as "fill" a reducing "schedule" like this unfortuantely must be comparatively dear. They themselves in their inceptional preparation have required, not merely their modicum of carbon but also a vast expenditure of power, converted into heat. And until plant, raw materials and operating charges for the production of such agents are absolutely costless, and power is likewise costless, they must remain dear in comparison with carbon, than which they can never be proportionately cheaper. In considering commercially the reduction of iron, whether at low temperature or otherwise, it is necessary to proceed upon the fact that carbon is—and upon the logical assumption that carbon always will be—its cheapest commercial reducing agent.

*Consulting engineer, Sheffield, England.

Solid Reduction or Reduction Below Melting Point

The reduction of a metal from its oxide at a temperature much below the melting point of that metal is no new thing. There can be no direct arithmetical relationship of the respective heats involved, since in the first case thermochemical happenings only, and in the second case physical attributes only, are concerned. Two of the most striking commercial instances of "solid reduction" familiar to us in everyday practice are:

The reduction of cube nickel from nickel oxide in the retort; and

The manufacture of metallic tungsten powder from tungsten oxide in the crucible.

In the first case reduction is carried out at some 500 deg. C. below, and in the second at some 2000 deg. C. below, the melting point of the resultant metal. Nor can the preparation of metallic iron from iron oxide at temperatures many hundreds of degrees below the melting point of iron be asserted to be novel; as a matter of fact the "solid" reduction of iron is the oldest recorded method of the production of that metal, and for very many centuries was the *only* method of procedure adopted in its extraction from natural products. The Catalan forge is of historic interest to the iron metallurgist; from it and from the native bloomery furnace of the Hindu sprang the blast furnace, a crude appliance in its early stages, but which by hundreds of years of patient work has been developed from its humble beginnings to the very perfect instrument which we know today.

The Blast Furnace Reactions

The modern blast furnace is certainly complicated —partly by reason of the many auxiliaries which are necessary to its successful performance; it is costly in erection and upkeep, and requires a very high grade of fuel supply, while it has these limitations of utility and of fuel economy which are imposed by the nature of its product and by thermochemical conditions of equilibrium. In point of fact the blast furnace of today must be reckoned partly as a smelting instrument with respect to its metalliferous charge and a portion of its fuel supply, and partly as a giant producer of potential power with respect to the remainder of its fuel supply. Very approximately speaking and neglecting the sensible heat fed into it through the vehicle of its hot blast

Basing his argument largely on the statement that about four-fifths of the reduction of iron oxide in the blast furnace is directly brought about by carbonous oxide at low temperatures, the author discusses the advantages of the direct process over the present one. He concludes that, because of the perfection in recent years of rotary kilns and powdered coal apparatus, some direct process ultimately will come into use.

supply, its efficiency in these two directions may be divided into equal parts.

Let us first of all review briefly the method in which a modern blast furnace functions in the smelting of iron, neglecting in such review those smaller secondary reactions which—minute in themselves—may affect very materially the quality of the resultant metallic product. The furnace takes the form of a vertical shaft continuously accessible at the top, and with provision near the bottom for the admission of a powerful blast of heated air; its operation is continuous. The materials fed at its top may conveniently be grouped into (1) those containing the source of iron (almost invariably the oxide); (2) "Fluxing minerals" (mainly limestone), and (3) the requisite quantity of fuel (generally in the form of a hard dense metallurgical coke, much more rarely in the form of charcoal, and even occasionally in the form of lumpy hard coal). The charge descends by gravity through the shaft; the resultant products of molten metal and of molten slag are removed more or less continuously from the bottom, space being thus provided for the introduction of more charge at the top.

The method of operation may be summarized as follows:

> Near the bottom of the furnace where the hot air entering meets with the by now incandescent fuel portion of the charge, the fuel is gasified, partially or entirely, the resulting gases consisting essentially of carbonous oxide and of diluent nitrogen.
>
> The iron oxide of the ore is reduced to metal, largely by the action of the carbonous oxide of the gas, and partly by the interaction of a portion of the solid (and as yet unconsumed) carbon of the charge and the oxide of iron. The former action is exothermic; both are easily reversible. Since the reducing action of carbonous oxide upon iron oxide begins at a temperature as low as 300 deg. C., and is fairly complete at temperatures little exceeding 800 deg. C., most of the actual reduction of the oxide of iron in a blast furnace is obviously done in a reasonably high zone in the furnace. As regards such portion of the metal-bearing charge as is reduced directly by contact with elementary carbon—this reaction, unlike the first named, is strongly endothermic—that is to say it requires considerable quantities of extraneous heat; it does not begin at such low temperatures nor is it completed quite as low as in the first considered case.
>
> The reduced spongy iron becomes impregnated with carbon, partly by direct absorption of that element and partly as the result of the catalytic decomposition of carbonous oxide, beginning at the comparatively low temperature of the reducing zone and continuing through the hotter zone.
>
> A portion of the silica content of the mineral is reduced by solid carbon at the high temperature prevailing in the lower zones of the shaft; the reduced silicon reacts with the carbide of iron formed as above described, precipitating the carbon partially or almost entirely in the amorphous or graphitic form, and replacing it in the iron mass itself.
>
> Some of the phosphorus content of the material is likewise reduced by solid carbon at or about the same point, the reduced phosphorus partly dissolving in the iron and partly forming an iron-phosphorus eutectic according to the circumstances of the case.
>
> The carbonates are decomposed in those zones in which at any rate a large part of the iron reduction takes place, giving lime and carbon dioxide.
>
> The resulting lime fluxes with the gangue of the ore and the ash of the fuel at those high temperatures prevailing in the lower zones of the furnace, forming slag.
>
> All the solid contents of the shaft—that is to say the whole of the materials entering it less such portions of them as have been gasified or vaporized—are, after having undergone decompositions and rearrangements as indicated, brought to a state of fusion in the hottest zones of the furnace, leaving either as fluid metal or fluid slag.

The cast metal product of the blast furnace (pig iron) is thus really an alloy of iron, mainly with more or less silicon and manganese and with varying proportions of sulphur and phosphorus according to the charge and method of work, which is freely interspersed with precipitated amorphous or graphitic carbon. Its very defects, however, prove to be its virtues, for such metal is comparatively easily meltable and casts readily and soundly, in both of which respects it differs markedly from pure iron. Where the resultant iron article required therefore is not called upon to possess ductility, where it is only required to possess reasonably high strength and where the comparative ease of producing the ultimate article is paramount, the product of the blast furnace is an ideal one. In other words, for the production of a pig iron which is to be used as cast iron, the blast furnace is here to stay, and its supercession can only possibly be effected by the development of some cheaper and more efficient means of reproducing its exact thermochemical conditions.

If the total iron requirements of the world were along these lines the case for the direct low temperature reduction of iron would indeed be a weak one. But a glance at the world's iron statistics shows that the proportion of pig iron ultimately to take the form of cast iron is relatively small; the large amount of it is required as an intermediate in the production of steel. And, speaking advisedly, pig iron or molten cast iron is a very poor steel intermediate for any other than a pneumatic process, where the reactions involved must of necessity be strongly exothermic.

Our only excuse for using such a high proportion of it must be that it is the most practicable intermediate which we have had at hand so far. That in any steel conversion process, which first of all calls for the melting down of the steel source under oxidizing conditions, some cast iron is required is definite, attributable mainly to the extraordinary solvent properties of that metal. But such quantity needs only to be far less than the average proportion now employed in practice. It is as a steel intermediate that we must regard the metal resulting from the low temperature reduction of iron ores; from its large employment in steel manufacture many economies will result and the steel produced will at the same time be greatly improved in quality.

Thermal Distribution in the Blast Furnace

It would be well next to consider in the main the thermal distribution, incidental to the production of cast iron in the blast furnace. It has already been said that substantially, of the fuel which gives us the reducing and heat forming agents in present blast furnace practice, one-half may be said to be emitted from the furnace in the form of potential heat in the gases, and one-half in the reducing and melting of the iron and the melting of the slag. It should be pointed out that the sensible heat contained in the exit gases has been neglected. Roughly one-third of these gases is withdrawn and burnt in the regenerative stoves wherewith the blast supply is heated, so that this amount of heat can be reckoned merely as circulating—except in so far as to some loss due to any inefficiency of the stoves.

At first sight it would not appear that the potential heat emitted should be affected by the substitution of "solid reduction" for present practice. As a matter of fact, however, it is, and for a very simple reason; in the blast furnace approximately four-fifths of the actual reduction is done by carbonous oxide and only one-fifth directly by means of carbon itself. The simple equation

$$FeO + CO = Fe + CO_2,$$

quite independent of its reversibility, is not a balanced reaction. Carbon dioxide acts as a powerful deterrent to the reducing effect of carbonous oxide on iron oxide. When the carbon dioxide equals in quantity the carbonous oxide present the reducing action of the latter on iron oxide virtually ceases. Careful investigation of a thorough average of blast furnace practice today will reveal the fact that, in the thermal conditions of the process, the amount of carbon dioxide present in the exit gases is accompanied by no less than one and a half times its own bulk of carbonous oxide. Carbon dioxide is the ultimate gaseous product of the actual reduction, and, with respect to the amount of carbon dioxide proceeding from such, we find ourselves under dictation by a natural law of equilibrium, which no form of apparatus designed by man can legitimately be expected to modify.

The total amount of carbon dioxide in blast furnace

gases does not, however, proceed from the reduction reaction. Part of it proceeds from the decomposition of the limestone which is introduced into the charge of the furnace for slagging purposes. Since this liberation of carbon dioxide takes place in the temperature zone concurrent with reduction it must nullify the efficacy of its equilibric amount of carbonous oxide, and by just such a proportion increase the amount required in the reduction. In the low temperature reduction of iron, however, no limestone need or should be added, and therefore carbon—or fuel—economy is attained.

Fuel and the Smelting Operations

As regards that half of the fuel used up in the furnace in actual smelting operations we have to consider the following:

More than two-fifths of the carbon in the charge is consumed chemically and thermally by the actual reduction of the oxide. This quantity cannot be effected other than by driving the reducing action further in the direction of direct reduction of iron oxide by carbon and away from its reduction by carbonous oxide; in other words, by departing as far as possible from "Gruner's ideal working." It would not be fair or logical to anticipate any improvement in this direction in low temperature reduction which could not be paralleled by modifications in blast furnace practice; therefore under this particular caption, fuel requirements must remain a constant.

A very appreciable proportion of the carbon used in the fuel dissolves, as has been shown, in molten iron, whereas the amount of carbon entering into combination with that iron simultaneously with its "solid" reduction at low temperature is less than one-fifth of the quantity.

Small fuel economies due to the siliconizing and phosphorizing of the iron would be effected.

Nearly one-fifth of the total heat usefully consumed is utilized in the heating of the metal and slag products of the blast furnace; in low temperature reduction the amount of heat carried away by the solid products would be less than one-third of this amount.

The driving off of water, etc., from the charge would consume equal amounts of heat whichever process be used.

In the blast furnace the amount of heat required for the expulsion of carbonates from the limestone in the charge accounts for close upon five per cent of the heat in the fuel used up; in direct reduction this would be avoided in toto.

The decomposition of the moisture in the blast supplying the modern blast furnace would be roughly paralleled, though minimized, by the decomposition of the moisture in air supply as to heat requirements.

Heat losses by cooling water and by radiation account again for nearly another fifth of the fuel utilized in the blast furnace itself. This source of loss would be minimized in low temperature reduction, firstly, because little or no cooling water would be necessary and, secondly, because the temperature difference between that prevailing inside the direct reducing apparatus and that in the atmosphere enveloping it outside would be much less than the temperature difference between that prevailing inside the blast furnace and that in its surrounding atmosphere.

Summary

Summing up, elaborate observations and calculations made by the writer determined the quantity of fuel saved in "direct reduction" as about 25 per cent of the total amount supplied to a blast furnace for the production of an equal unit of pig iron. This, however, only refers to economy as to *quantity;* 2000 lb. of high grade and expensive fuel can in the former conditions adequately be replaced by 1500 lb. of low grade fuel of the cheapest description.

It should be remarked in passing that in any method of reducing iron by means of carbonaceous matter under commercial conditions we are wandering amid a maze of reversible reactions, wherein carbon and its oxides, metallic iron and its oxides, and hydrogen and its oxide form the major factors, kaleidioscopic in their ever changing juxtaposition and continually varying in their relative proportions. Hence it is advisable not to attempt resort to simple calculation but to base remarks upon observed facts.

Direct Processes in General: It is not proposed in these remarks—nor is it in fact germane to the present issue—to deal in detail with the many scores of low temperature iron reduction processes which have been attempted in the past, or have been patented, in many cases apparently by visionaries. Several processes have been tried and have failed completely in their commercial accomplishment; this failure could be anticipated by anyone with a knowledge of thermochemistry and thermophysics. Others brought forward have been so complicated in their nature and so utterly opposed to all principles of good technology that their practical trial must prove (or have proved) futile. Others again held the promise of success, if the necessary mechanical arrangements had been available for properly translating them into practice. Suffice it to say that the modern development of the rotary kiln and the correct application of pulverized coal have now made the commercial reduction at low temperature of iron from its ores an actuality.

Introduction of Impurities: In the consideration of the low temperature reduction of iron, quite apart from the considerations of commercial economy involved, what is undoubtedly an oxerwhelming advantage has been completely lost sight of. It has long been recognized by a few that some of the most deleterious constituents which may exist in iron or steel are those whose presence remains unrecognized in ordinary methods of examination. Noteworthy among these is combined nitrogen. It is interesting, in the light of the dicta over many years of that small band of investigators which includes the author, to note the growing interest in this particular branch of the subject, with reference to which the results of some really valuable work have appeared lately in the technical literature of the United States. Quite obviously iron does not take up nitrogen as the result of exposure in the molten condition to nitrogen in its elementary form, otherwise no good steel or iron could be made by any of the processes practised today. Nitrogen enters into combination with iron via the "cyanogen reaction" and, in the conditions of the modern blast furnace, such reaction must perforce be brought about.

Nitrogen and Vanadium: Two means of counteracting it exist in blast furnace practice, in fact one is unwittingly practised daily. The first consists in the presenting to the product of the "cyanogen reaction" something which has a greater affinity for nitrogen than has iron. Oxide of vanadium, or its partially or entirely reduced product, constitutes that means. It is to be noted that most Swedish iron ores contain considerable quantities of vanadium oxide; the virtues of high grade Swedish pig irons and of the metals resulting from their further beneficiation do not need emphasizing. The second means is to treat with metallic vanadium, or rather its iron alloy ferrovanadium, the everyday product of the blast furnace, and thus to remove from the cast metal as much of its nitride contents as conditions of thermal equilibrium will allow. The results of denitrogenizing iron or mild steel in this manner are too well known to need reiteration.

In the process of the low temperature reduction of iron, at no time is heat generated sufficient in intensity to bring about the "cyanogen reaction," and therefore the metallic product of the low temperature reduction of iron is practically free from nitrogen and, other things being equal, possesses an extraordinary degree of inherent toughness and vitality.

Present Equipment and Direct Processes: It has been said, probably without any modicum of truth, that processes for the low temperature reduction of iron have not received encouragement mainly because their successful practice must and would clash with the vested interests connected with blast furnace work. Such a statement could only be made as the result of woeful shortsightedness; for really a plant for "solid reduction" must be at all times a most valuable ancillary to the blast furnace. Those responsible for working that furnace will, it is thought, unanimously admit that one of the greatest foes to the successful operation of that invaluable apparatus is dead-fine ore. And dead-fine ore is precisely the charge which the "solid reduction" plant requires to work upon. The real main obstacle to development has rather been the lack of

those mechanical means necessary to carry to a conclusion a good process of low-temperature iron reduction; the enormous strides which have been made during the last few years in the design, construction and application of the rotary kiln and of the production and application of pulverized fuel, have offered a complete solution to practical difficulties.

In conclusion, the low temperature reduction of iron must speedily come into our commercial practice, since it promises so many advantages. Notable are:

That the outfit required for its successful performance is relatively simple;

That its use leads to great economies in the fuel, wages, and power bills, and

That its product is of a very high degree of excellence.

It may confidently be prophesied that the next 10 years will see a very general adoption in industrial practice of the commercial reduction of iron from its ores at low temperature.

Annual Report of Youngstown Sheet & Tube Co.

President Campbell Tells About Consolidations and Expresses Confidence in the Wisdom of Action Taken

YOUNGSTOWN, March 25.—Gross sales of the Youngstown Sheet & Tube Co. for the year ending Dec. 31, 1923, totaled $165,649,369.42, on total shipments of 2,946,779 tons of products, according to the annual report made public last Saturday. Payrolls last year were $43,154,814.26. Net profits from operations of combined companies for the year before providing for depletion of minerals and depreciation of plants were $27,597,193.91. After deducting items for mineral depletion, plant and equipment depreciation, interest and discount on funded and long-term debt and interest on loans, and provision for Federal income taxes, net profits available for surplus amounted to $15,673,750.45.

Of this total, $11,334,534.58 represents profits carried to the surplus account of the original Youngstown Sheet & Tube Co. and $4,339,215.45 profits of the Steel & Tube Co. of America and the Brier Hill Steel Co., from Jan. 1, 1923, to dates of acquisition of properties, applied in payment of preferred dividends of those companies and in reduction of book value of properties taken over.

Shipments for the year included 165,360 tons of iron and zinc ores, coal and coke; 879,454 tons of pig iron, ingots and scrap; 1,747,189 tons of rolled steel and other finished products; 154,776 tons of miscellaneous materials and coke by-products, and 30,513,637 gal. of benzols and tar.

President Campbell's Remarks

In connection with the report, President James A. Campbell, who is now on the Pacific Coast, submitted the following statement:

"Favorable conditions prevailed during the first half of the year, good demand at increasing selling prices continuing throughout that period. The last half of the year was less favorable, as demand decreased and some recession of selling prices obtained. During the third quarter the 12-hr. day was eliminated and wages readjusted to the new basis of eight and ten hours. This materially increased labor costs.

"The plants and properties formerly owned by the Brier Hill Steel Co. were purchased early in the year and taken over on March 1, 1923. These properties were paid for in stock and by the assumption of first mortgage bonds to the amount of $10,000,000 and all other obligations of the Brier Hill Steel Co. and its subsidiaries.

"On July 1, 1923, possession of the plants and properties formerly owned by the Steel & Tube Co. of America was secured. These properties were bought in January, 1923, but delivery was delayed by injunction proceedings instituted by minority stockholders of the selling company. Part of the purchase price, viz.: approximately $33,000,000, was paid in cash. The balance was paid by assuming approximately $22,500,000 in bonds of the Steel & Tube Co. of America, and all other obligations of that company and its subsidiaries. To provide cash necessary for this purpose, and also for additional working capital, $40,000,000 in debenture bonds were issued by the Youngstown Sheet & Tube Co. The purchase of both these groups and properties and the method of financing employed were approved by the stockholders at the meeting, Feb. 28, 1923.

"Among the properties acquired by these purchases are valuable reserves of iron ore, coal and limestone which greatly strengthen the position of your company in this respect. The board of directors is confident that these properties will prove very desirable additions from an operating standpoint as well, making possible reduced transportation and overhead charges and affording better facilities for distribution. These economies and advantages are essential to enable us to meet increasingly keen competition and hold our fair share of trade.

Plant Additions

"Greater advancement has been made during the last two years than for ten preceding years in the direction of improved methods and machinery for producing steel and its finished products. The board of directors, recognizing this fact, has appropriated a large amount of money to be expended during 1924 and 1925 for the purpose of keeping the plants in the highest state of efficiency. In addition to this, the following new construction has been authorized:

"A new sheet mill plant at the Brier Hill Works, consisting of eight mills designed for the manufacture of full-finished sheets for furniture, automobile and similar purposes.

"One new blast furnace and two buttweld tube mills at the Indiana Harbor Works.

"When these additions have been completed, as they should be during the present year, your operating plants will be better balanced than ever before.

"Good business for the first half of 1924 seems assured if the Mellon plan or some legislation similar in effect is enacted by Congress. In this event there will be plenty of money for investment in all kinds of business enterprises and present prosperity may be expected to continue."

The Sheet & Tube company reports gross assets of $256,954,248.62, including the following items: property accounts, $164,264,368.35; investments in and advances to mining and other companies, $7,607,781.58; balances due on employees' dwelling purchase contracts, $734,816.80; sinking fund investments, $842,188; investments of insurance fund, $73,692.13; current assets of $80,559,913.74, including $53,643,261.82, representing inventories of finished and semi-finished products, raw materials and supplies; $20,798,082.16 in accounts and notes receivable, less reserve; $178,898.90, due from officers and employees; $3,264,105.85, sundry marketable securities and United States Treasury certificates of indebtedness (at or below market); $2,675,565.01, cash on hand, in banks and in transit.

The final asset item in the statement was $2,871,488.02, representing bond discount, prepaid taxes, insurance and other expenses paid in advance.

The Sheet & Tube company maintains 19 branch offices in various centers, in addition to the general offices at Youngstown.

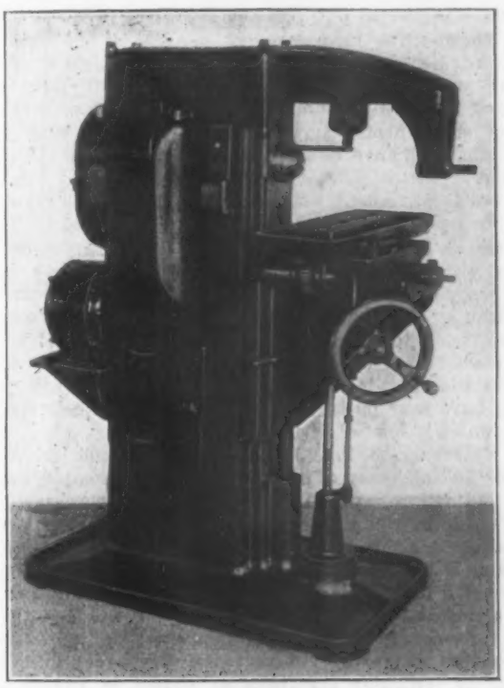
R. J. Kaylor, publicity manager, points out that in the last year it paid a total of $3,178,019 in taxes of all kinds, and paid the railroads for freight $21,816,737. The company consumed 4,558,909 tons of coal and 3,979,442 tons of iron ore. The estimated number of cars used once in mine and mill operations was 553,000.

NEW HAND MILLING MACHINE

Individual Motor Drive with Push-Button Control —Overhanging Arm a Ribbed Casting

A new 5-in. production hand milling machine, designed to be equipped with individual motor drive, has been placed on the market by the Pratt & Whitney Co., Hartford. The power may be controlled either by a push button or snap switch mounted on the machine itself. The motor is geared directly to the spindle, an arrangement intended to provide full power to the cutter notwithstanding variations of spindle speed. Transposing slip gears are used for changing the spindle speeds, these gears being made accessible by the removal of a cover plate on the rear of the column.

The arrangement of the motor may be noted from the illustration. This position of the motor is considered low enough to avoid tendency toward vibration or unsightly appearance, at the same time being high enough above the floor to keep the motor free of chips and sweepings. Placing the motor on a bracket is intended to provide accessibility for lubrication, inspection and adjustment, also making the replacement of the motor convenient. This position of the motor also makes it possible to conveniently apply any style or make of motor desired. Single-pulley belt drive is also available, in which case a pulley is mounted within the column and the gears which mesh directly with the motor pinion are removed. Belt guards are provided and a tight and loose pulley countershaft is used. This change of drive may be made conveniently.



Production Hand Milling Machine. Arrangement of driving motor and push button control are features, as is also the placing of the operating controls within easy reach from operator's position

The overhanging arm is a ribbed casting instead of the usual solid bar which is claimed to provide more rigid support with equal weight of metal. The outboard support is also a ribbed casting. The latter fits in a T-slot on the under side of the arm and carries the usual mounting for an arbor. The arm is fastened on the column by four bolts, which are placed so that the arm may be reversed and fastened out of the way of high work. A column cover is available for cases when the arm is not desired. The vertical column of the machine houses all gearing and other moving parts.

The table and feeding devices are similar to the company's previous hand milling machines, although some improvements have been added. Stop dogs are provided in both directions. The table longitudinal travel is obtained through lever, pinion and rack, the vertical travel being by means of a large handwheel which is geared to the vertical elevating screw through miter gears. The cross slide is operated by a crank, and is fitted with a micrometer dial for fine adjustment. Controls are located so that the operator can reach any of them without shifting his position. The vertical stop is placed close to the elevating screws in order to keep the various strains as nearly as possible in line. Suitable binders, etc., are supplied on all sides.

The table working surface is 5 x 17 in. and a ⅝ in. T-slot is provided for mounting fixtures. The longitudinal travel of the table is 12 in., a single setting of the lever giving a travel of 5 in. The vertical travel of the knee is 8 in.

The spindle is mounted in adjustable bronze bushings, the front bearing being conical. A ⅝-in. hole in the spindle allows for a drawback rod when desired. The spindle nose carries a standard No. 9 B & S taper hole which fits standard arbors. Maag gears are used for the spindle speed change gears. Spindle speeds from 65 to 650 r.p.m., in geometrical progression, are available.

The machine is regularly equipped with a small oil pot, but provision has been made for a pump when desired. The inside of the column forms the oil reservoir, and the pump is inside directly above the oil level, being driven by a chain from the main drive shaft. The cutting compound is piped up to the work and is carried away from the table through a series of screens and troughs to a vertical telescoping pipe which returns the oil to the reservoir in the base of the column.

The machine is standardized for various milling machine attachments, arbors, etc., and as far as possible has been made interchangeable for other standard milling machine attachments.

Sizes and Varieties of Steel Barrels to Be Eliminated

WASHINGTON, April 1.—Elimination of 40 sizes and varieties of steel barrels and drums, to become effective Jan. 1, 1925, was decided upon last Wednesday at a meeting of manufacturers and consumers' representatives in the Department of Commerce under the auspices of the Division of Simplified Practice. Surveys made previous to the conference had shown more than 75 sizes and varieties made in eight types, and had also indicated a wide diversity of dimensions. The latter problem was referred to the manufacturers' group which, it was indicated by D. S. Hunter, of the Steel Barrel Manufacturers' Association, Cleveland, would ask that the American Engineering Standards Committee undertake a study as a prelude to possible further action.

Of 21 sizes of standard light shipping drums, it was voted to retain five, of 55, 50, 30, 15 and 10 gallons capacity. Of 15 sizes of Standard I. C. C. drums, it was voted to retain those of 110, 55, 33, 15 and 10 gallons capacity. For the classes of light drums with friction cover and bolted cover, it was voted to retain out of the 15 sizes made those of 60, 55, 50, 40, 30, 15 and 10 gallons capacity. In this class, too, it was voted to eliminate the 12-in. opening, retaining the 9-in. and 15-in. sizes.

It was voted to defer action on simplification of bilge barrels and bilge barrels with removable heads, I. C. C. and light drums with removable heads to a future conference, except for the 55 gallon size in the first named item.

The conference also voted to include representatives of the petroleum, chemical and paint and varnish groups in the central committee which will make surveys after the plan has been in force some time.

DeCourcy Browne, Inc., 120 Broadway, New York, is specializing in refined ferromanganese (low carbon) which is particularly desirable for use in making special alloys and low-carbon alloy steels.

Tension Testing of Thin Plate Metals

New Test Grips Claimed to Insure Accurate Results on Duralumin and Alloy Steel Sheets

BY N. S. OTEY*

TO those interested in testing thin plate metals the need for more reliable test grips has long been a source of concern. This need has been stimulated by the development of alloys requiring accurate physical research and inspection, which has occasioned much valuable work[1] in the design of testing apparatus.

Some of the more pronounced defects in design of

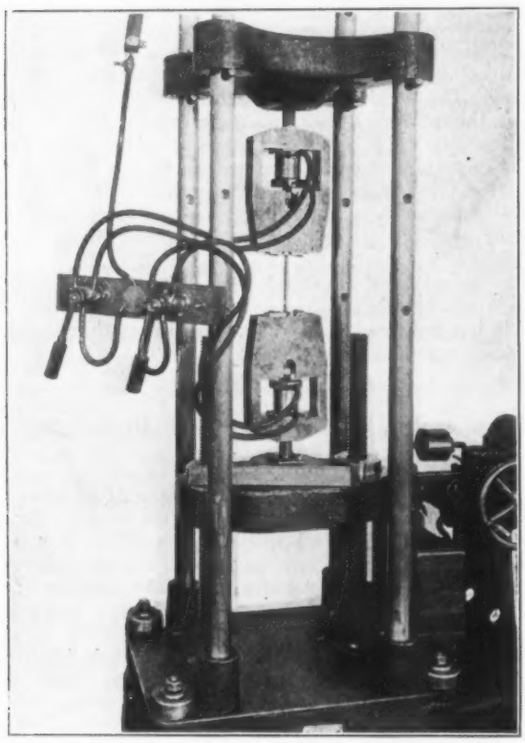


Fig. 1—General Appearance of New Gripping Device, as Installed in a Testing Machine, for Testing Thin Metals

the ordinary grips which lead to inaccurate test results are:

Mis-alinement: For convenience these grips are constructed to operate in fixed relation to the pulling and weighing heads of the machine. Since no adequate provisions are made for retaining these heads in axial alinement, eccentric loading of the specimen occurs. This produces what is commonly known as tearing stresses.

Non-adjusting: As variations in thickness of plate metals are unavoidable, one edge of the specimen is held more rigidly than the others because of the absence of any self-adjusting feature in the grips. This also produces eccentric loading and consequently contributes to tearing stresses.

Slippage: This may be attributed to: (a) lack of sufficient penetration of the jaw serrations when load is first applied; (b) absence of uniform follow-up pressure on the jaws that will equalize subsequent deeper seating of their serrations and deformation of the machine heads in which they operate. It is necessary that this pressure be maintained throughout the test if reliable results are required.

After extensive experiments with various types of test grips reported, the writer has developed a new gripping device, a general view of which is shown in Fig. 1. This device consists of a pair of auxiliary grips that may be used on the ordinary universal testing machines. The upper and lower units are identical in design, each being composed of a retaining frame, gripping jaws, and air-driven piston for operating the jaws, a universal pull bar and a control valve.

These grips have been in use for several months at the Naval Aircraft Factory, Philadelphia. They have proved to be free from the defects mentioned above in testing aluminum, duralumin, and hardened alloy steel sheets varying in thickness from 0.01 in. to 0.25 in. and have effected a great saving in time and labor.

Axial alinement of the two units and consequently of the specimen is provided by the universal pull bar shown in Fig. 2. This bar is similar to the commercial type except that it is seated on twenty-six (26) ⅜-in. ball bearings. In order to adapt this bar to the machine it is only necessary to turn a recess in the standard head block to receive the concave race A. A stirrup is placed over the head of the bar to further secure it to the machine. Experience has shown that these pull bars may be turned easily, by hand, when operating under a load of 10,000 lb.

Referring to Fig. 3, automatic adjusting to variations in thickness of the specimen is accomplished by self-adjusting jaws, A and B. One of these jaws, A, is free to move on a horizontal axis, the other on a vertical axis. Each is seated in a properly formed adapter, C and D respectively. All of these parts are made of hardened tool steel, the bearing surfaces being finished by grinding.

In order to check the effectiveness of these self-adjusting parts, specimens were prepared with grip ends of irregular thickness as shown in Fig. 4, and tested. Examination of marks produced by the jaw serrations showed uniform penetration over the entire gripping surface of the specimen.

The grips are operated by a pneumatic piston, E, Fig. 3, which applies an initial load of approximately

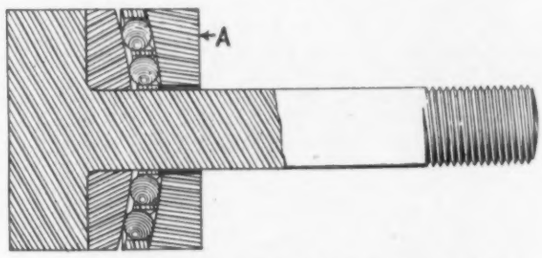


Fig. 2—Universal Pull Bar for Insuring Axial Alinement

200 lb. to the jaws through push bar, F, and yoke, G. This load remains on the jaws throughout the test and has been found to eliminate the difficulties of slippage experienced in using the older types of grips. The specimen is released by reversing the action of the piston. The yoke, G, is slotted at the ends to allow the jaws to open and close which is done by guide pins (not shown) that are driven in the sides of the frame, H. These pins operate in grooves cut in the sides of the adapters, C and D, parallel to their angular faces.

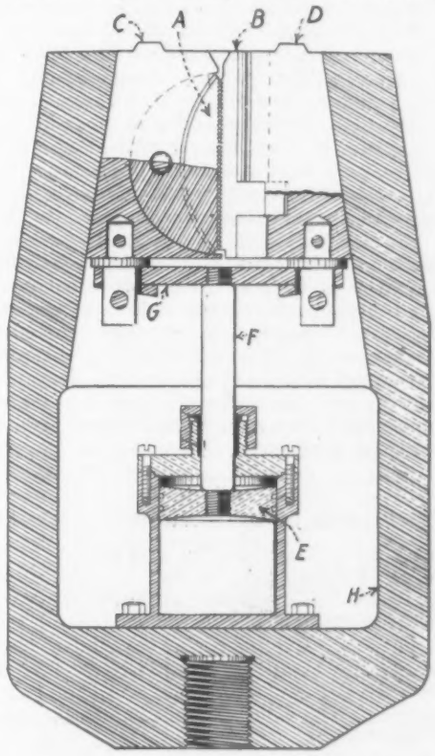
The frame, H, of Fig. 3, is machined from a solid bar of steel in order to obtain the necessary rigidity.

*Assistant research engineer, Naval Aircraft Factory, Philadelphia.

[1] *Proceedings* American Society for Testing Material, 1923, Report of Committee E-1.

Deformation of this frame would promote slippage and destroy to a certain extent the self-adjusting action of the jaws. This was one of the difficulties experienced in using other types of auxiliary grips.

The valves used to operate the pistons are shown at the left in Fig. 1. They are of the ordinary cone



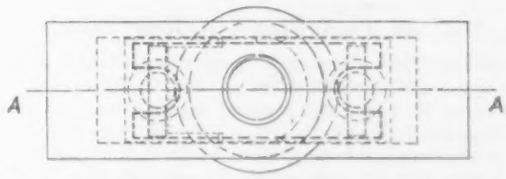


Fig. 3—Self-Adjusting Jaws, *A* and *B*, for Accomplishing Automatic Adjustment to Variations in Thickness of Specimens

sleeve type, vented as shown in Fig. 5, and by their reciprocation through the angle Θ the jaws are opened and closed.

In course of testing a variety of sheet metals with these grips some rather interesting conditions have been revealed. It was found that due to the absence of slippage the yield point, as observed by the beam drop, is very prominent even on comparatively hard mate-

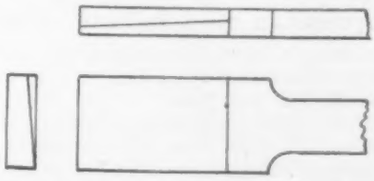


Fig. 4—Specimens with Grip Ends of Irregular Thickness for Testing Effectiveness of Self-Adjusting Parts

rials such as heat-treated alloy steel of 150,000 lb. tensile strength. It was also found that the elimination of slippage caused the load to build up too rapidly on light specimens to take extensometer readings. This occurred on the slowest speed of the machine, which had formerly been used for research work and it was necessary to change the type of motor used in order to obtain workable speeds.

Obviously, many advantages of this device can be applied to testing other than plate metals. The time saved through its sensitivity to rapid operation, for routine testing, has already fully justified its cost, not to mention the advantages of obtaining accurate stress and strain readings.

The writer is greatly indebted to the manager and

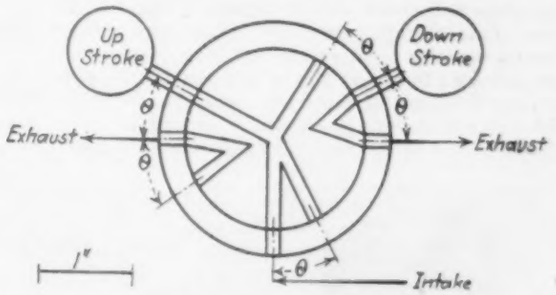


Fig. 5—Valves for Operating the Pistons Are of the Ordinary Cone Sleeve Type. By their reciprocation through the angle Θ, the jaws are opened and closed

chief engineer of the Naval Aircraft Factory for permission to publish this and to the members of the factory for assistance in construction and operation of these grips.

Cost of Living Falls

Cost of living figures of the National Industrial Conference Board show a decrease in February, compared with January, the latest figure being 63.9 per cent above the level of July, 1914. Decreases in food and fuel were partially offset by an increase in the cost of clothing. The purchasing value of the dollar, based on these figures, is 61c., compared with 100c. ten years ago.

As the average of weekly earnings has been stationary at $26.94, some industries showing decreases while others balance them with increases, there was a gain of real weekly earnings. The purchasing power of weekly earnings in January, 1924, was 31 per cent higher than in July, 1914.

The National Federation of Iron and Steel Manufacturers, Caxton House, Tothill Street, London, has just issued a new edition of its pamphlet entitled "Statistics of the Iron and Steel Industry." This volume of 91 pages contains data for 1922 and earlier years covering the United Kingdom, the United States, France, Germany, Belgium, Luxemburg, Sweden, Italy, Spain, Canada, India and Australia. These statistics can be obtained from the Federation for 5s. 4d., post free.

The Columbia Industrial Co., Cincinnati, subsidiary of the Columbia Gas & Electric Co., which is building a power plant near Cincinnati, has been incorporated with a nominal capitalization of $500 to develop an industrial center around the new electric plant. The company has acquired 1500 acres, which will be equipped with railroad tracks, water and electric power supply and other facilities for manufacturing purposes. W. W. Freeman is president of the company.

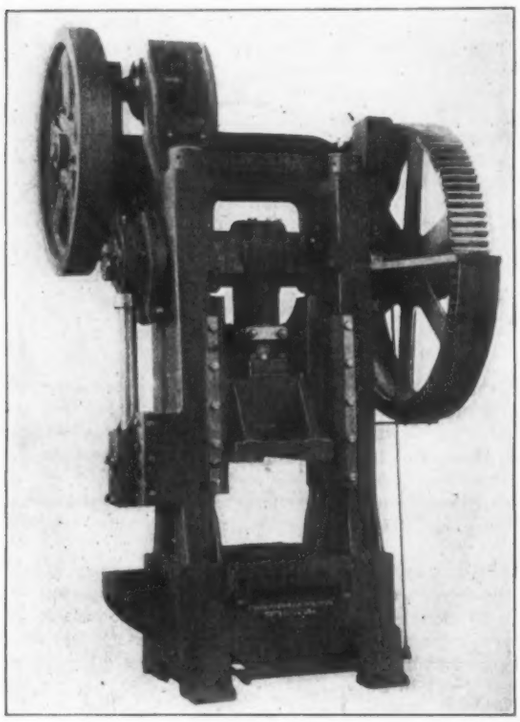
The Armco International Corporation, Middletown, Ohio, a subsidiary of the American Rolling Mill Co., has been organized with a capitalization of $50,000. The company will act as a foreign sales organization for Armco products. Calvin Verity, treasurer of the American Rolling Mill Co., heads the company as president.

C. A. Sleicher, president of the Interstate Foundry Co., Cleveland, has leased one of the gray iron foundries of that company from the receiver and will operate it for the present manufacturing castings for consumers that had contracts with the Interstate company.

Drop Forge Trimming Press

A single-crank straight-sided press, designated as the No. 510-T trimming press, being provided with an outer slide, as shown in the accompanying illustration, for trimming work, has been added to the line of the Niagara Machine & Tool Works, Buffalo.

The frame is made up of four pieces, the bed, two uprights and crown bolted together, and tied by four steel rods shrunk into place. The rods are of sufficient capacity to carry the full load of the press, and are intended to relieve the uprights of tensile stress and obviate breaking of the frame through overstrain. The driving mechanism is located overhead in order that it will be out of the way of the operator and away from



Power Press With Outer Slide for Trimming Work. Bed, uprights and crown are tied by steel rods, shrunk into place

scale and dirt. The action of the machine is controlled by the company's jaw clutch.

A dove-tailed recess is provided in the bottom of the slide for use in mounting the dies, and flanges extending toward the front and back on the bottom of the slide increase are intended to provide increased bearing surface for the dies. The outer slide is actuated by an eccentric keyed to the main shaft and may be used for punching dies as well as for cutting tools. The vertical elevation of the outer slide may be adjusted by turning the connection rod, which is threaded at its lower end, into the pivot block of the slide. The bottom of the outer slide has a round hole in which upper cutter holders or punch shanks may be fastened by a set screw. The bed for the outer slide is cast integral with the frame, and is provided with a round hole to accommodate dies for punching operations. The press illustrated is arranged for individual geared motor drive, the motor being supported by a bracket attached to the crown as shown.

The specifications are as follows: Bed area, front to back, 40 in. and right to left, 27 in. Die space, bed to slide, stroke down and adjustment up, 16 in. Standard stroke of slide, 6 in.; adjustment of slide, 4 in. Outer slide from center frame, 7½ in.; stroke, 3 in. The shipping weight of the press is approximately 27,000 lb.

Steam drop hammers and trimming presses to the number of 40 are to be supplied by the Erie Foundry Co., Erie, Pa., to André Citroën for the new plant which that French automobile builder is constructing in Paris, with no small amount of American equipment.

Superior Steel Products Co. to Build Plant at Monaca, Pa.

Organized by men long engaged in the manufacture and sale of cold-finished steel, the Superior Steel Products Co. will soon begin the construction of a plant at Monaca, Pa., on a site along the line of the Pittsburgh & Lake Erie Railroad. Officers of the new company, which is to be capitalized at $100,000, are M. P. Simpson, president, William Elmes, vice-president, Frank H. Guppy, secretary, and Homer H. Swaney, treasurer. Mr. Swaney is an attorney and a member of the law firm of Martin & Swaney, Beaver Falls, Pa. The other men until recently were associated in executive capacities with the Moltrup Steel Products Co. and previously had been with the Standard Gauge Steel Co., Beaver Falls.

The first unit of the new plant will be a building 300 ft. long and 60 ft. wide of modern fireproof construction, fully equipped with cranes and other conveniences for material handling and so arranged that additions can be easily made. The company will manufacture cold-finished steel in standard and special shapes; screw steel, shafting and polished rods, round, hexagon, flat and square cold-drawn steel bars, finished steel plates and other steel products.

Wealth of the United States

WASHINGTON, April 1.—The preliminary estimated wealth of the United States on Dec. 31, 1922, is fixed by the Department of Commerce at $320,803,862,000, as compared with $186,299,664,000, in 1912, or an increase of 72.2 per cent. Manufacturing machinery tools and implements were valued at $15,783,260,000, or an increase of 159.1 per cent over 1912, when the value was $6,091,451,000. The value of farm implements and machinery rose from $1,368,225,000 in 1912, to $2,604,638,000 an increase of 90.4 per cent; railroads and their equipment increased from $16,148,532,000 to $19,950,800,000, or 23.5 per cent.

Buffum Tool Plant in New Hands

Buffum Tools, Inc., has been incorporated to take over the plant and business of the Buffum Tool Co., Louisiana, Mo., manufacturer of masons' tools. William G. Marqua, for many years with the American Steel Foundries, is president of the new company, and James F. Caslin, for 28 years with Fayette R. Plumb, Inc., tool manufacturer, Philadelphia, is vice-president and general manager. Other officers are: John W. Porter, secretary and treasurer; Mrs. Ethelyne Tinsley Reineking, assistant treasurer; Marion Crabtree and E. C. Cooper, directors, and J. W. Matson, attorney.

The American Steel Foundries has supplied the financial backing for the taking over of the Buffum business. Mr. Marqua has been purchasing agent at Granite City, Ill., for American Steel Foundries, while Mr. Caslin has been superintendent of the heat treating departments of all of the plants of this company.

Employment in Steel Industry Increases

WASHINGTON, April 1.—Employment in the iron and steel industry increased 4.7 per cent in February when compared with January, based on the reports to the Bureau of Labor Statistics, Department of Labor, from 216 establishments. The number of workers engaged in these plants in February was 276,414, as against 264,110 in January. The payroll increased 10.6 per cent, amounting to $8,619,428 as against $7,794,020.

Based on the reports from 8222 establishments in 52 industries, employment in February showed an increase of 1.2 per cent over January. Industries other than iron and steel showing increases included sugar refining, stove, stamped ware, carriage, dyeing, finishing textiles, women's clothing, glass, fertilizer and automobiles. An increase in the number of employees in the stove industry was 1.8 per cent, in the machine tool industry 1.7 per cent, while a decrease of 1.6 per cent was shown in foundry and machine shop products.

Chromium and Its Relation to Industry*

Effects of Its Addition to Steel—Why High Chromium Steels Are Stainless—Alloys with Other Metals

BY DR. WALTER M. MITCHELL

CHROMIUM has been called the "master" metal because of the remarkable properties which have made it indispensable as a constituent of certain classes of alloy steels, heat and corrosion-resisting alloys. Whether it is advisable to class any metal as a "master," or say that it is indispensable, in these days of spectacular advances in metallurgy is perhaps questionable. Nevertheless, it is difficult to exaggerate the importance of a metal which, through its characteristic properties, probably influences in a vital way a more diversified range of industrial activity than any of the others which are in common use, excepting iron. Furthermore, as its valuable and unique properties become better developed and utilized, particularly in metallurgical and chemical industries, it must eventually advance to still greater importance.

The largest use of chromium is in metallurgical industries, the remainder is used for the manufacture of pigments in the dye and dyestuffs industries, in chrome tanning processes, and a very considerable portion in the form of the ore chromite as a refractory material in furnace construction. The metal, until the advent of chromium plating, has had no important use in the pure state, its useful compounds being prepared directly from the ore. As a refractory material chromite is nearly ideal, not only because of its high melting point, which is well above the operating temperature of either open-hearth or blast furnace, but also because of its essentially neutral character.

Effects of Chromium on Steel

The chief interest of chromium to the metallurgist, however, is its use in the steel industry for the manufacture of alloy steels and of heat and corrosion-resisting alloys. [Here the history of the metallurgical uses of chromium was briefly given.] The effects produced by the addition of chromium to steel are as follows:

(a) The lowering of the eutectoid ratio.

(b) The retarding action upon the allotropic transformations of iron, also upon the speed of diffusion of carbon in steel.

(c) The formation with carbon of a series of carbides which are not only extremely hard, but which go into solution very slowly and then only at high temperatures.

Retardation of Transformations: The principal effect of chromium is to retard all transformations occurring during the heat treatment of steel; not only the rate at which the solid solution is formed above the critical range, but also the rate at which dissociation takes place when cooling to atmospheric temperatures. Hence chromium steels are more difficult to render homogeneous and remain harder than straight carbon steels when subjected to the same heat treatment.

The resultant effect upon the physical properties is increased hardness, finer grain structure, and higher tensile strength without much loss in ductility. The retarding effect of chromium permits a much slower rate of cooling with the retention of hardness than in straight carbon steels. Hence the interior of large sections will remain harder when made of chromium steel. For this reason such steels are known as "deep hardening." Still greater chromium content results in a critical cooling velocity which is so much slower that the steels remain hard when merely cooled in air, and are hence called "self-hardening" or "air-hardening" steels.

When present in steel, chromium combines with the carbon to form a series of carbides which combine with cementite to form double carbides of iron and chromium. Chromium will be present in solid solution in the iron only when present in excess of the proportion necessary for the formation of the carbides, the composition ratio of chromium to carbon being about 10:1. When the chromium content is less than this ratio, the steels are pearlitic or sorbitic and are not sensitive to the rate of cooling. If this ratio is exceeded, the retarding effect of chromium will cause the steels to become martensitic or even austenitic on slow cooling. In such cases the Ar_1 transformation is depressed or it may be altogether suppressed, thus giving rise to the self-hardening quality from the retention of carbides in solution.

While there are no abrupt changes in the physical properties of chromium steels when the chromium content is increased because of the formation of different carbides, or the presence of a solid solution of iron and chromium, nevertheless the general character of the commercial usefulness of the chromium steels changes with the chromium content, and they may be divided into several groups because of their differently useful properties.

Low Chromium Steels: The first is the low chromium or pearlitic steels which are used for rolls, dies, tools, ball and roller bearings, files, etc. Here the effect of chromium is to produce finer grain structure and greater hardness without brittleness. Combined with nickel, the nickel chromium steels are probably the most useful and extensively used of all alloy steels, combining great strength and toughness and are of particular value in withstanding shock. Their use extends from armor plate, projectiles, ordnance, to automobile products, machine parts, etc. Other alloy steels containing chromium are chrome-vanadium, chrome-molybdenum, chrome-nickel-molybdenum, etc., in all of which chromium increases hardness and refines grain structure.

Chromium magnet steels, developed during the war because of tungsten shortage, where the very highest magnetic properties are not necessary, form a very satisfactory and efficient substitute for the higher priced tungsten and cobalt steels. In composition they run from 0.80 to 1.00 per cent carbon and 2 to 4 per cent chromium.

Chromium in High-Speed Steels: The use of chromium in high-speed steels is well known, although the exact manner in which it acts is still a subject for discussion. Unquestionably it is a necessary and essential ingredient. Considering all investigations on the subject, the self-hardening properties of these steels appear to be due very largely to the chromium; while the effect of tungsten is to raise the temperature at which the softening and tempering begins; but with both chromium and tungsten present the secondary hardness of these steels, on which their usefulness as tool steels depends, is greatly increased.

Stainless or High Chromium Steels

Owing to its great resistance to attack by corroding agents, the high percentage of chromium in steel gives rise to non-corrosion qualities, and such steels are hence known as "stainless." The chromium content of these steels averages between 12 and 14 per cent, with carbon 0.30 to 0.35 per cent when they are used for cutlery,

*From an address before the Washington Chapter of the American Society for Steel Treating, March 21. The author is metallurgical engineer, E. I. du Pont de Nemours & Co., experimental station, Henry Clay, Del.

etc.; to 0.10 per cent or under for the so-called "rustless" or "stainless iron." Due to the large proportion of chromium these steels are self-hardening, a considerable portion of the chromium being retained in solid solution under all conditions.

The stainless quality of these steels is fully developed only when the maximum chromium is retained in solution; that is, when the steels are in the hardened condition. They resist tempering to a remarkable degree and retain corrosion-resisting properties until appreciably softened.

Steels, or rather alloys, with high carbon and chromium content are austenitic on slow cooling, resembling manganese steel in being difficult to machine. These alloys combine both non-corrosive qualities, great mineral hardness and toughness, and resistance to oxidation at high temperatures. So far their use has been limited, but, owing to the valuable properties which they possess in combination, should form a most useful material for chemical and metallurgical processes which must be conducted at high temperatures and under considerable pressure.

Alloys of Chromium

Of the alloys of chromium with other metals and iron, the nickel and cobalt alloys have the widest usage, particularly the former on account of their lower cost. The useful properties of these alloys are the following:

(a) Great resistance to heat and to electricity.
(b) Absence of deformation and deterioration through scaling at high temperatures (up to 1100 deg. C.

These alloys were first introduced in 1905 as a material for resistance wire, for heating units used in electrical trades. Later on, in 1916, the nickel-iron-chromium combination was introduced as a non-oxidizable material for carburizing pots, annealing pans, furnace parts, etc.

So far it seems a fairly safe assertion that no really satisfactory heat-resisting alloy has yet been developed that does not contain chromium in at least some proportion. In commercially useful alloys the content is from 10 to 35 per cent, the balance nickel and iron. The ductility and heat resisting qualities of these alloys vary with the iron content, which for resistance wire, etc., should not run over 25 to 35 per cent, and for carburizing pots, heat-treating equipment, etc., should not be greater than 12 to 15 per cent in order to prevent distortion. Nickel chromium alloys of suitable composition will withstand heated gases such as steam, carbon monoxide and dioxide, ammonia and even pure oxygen up to 1100 deg. C. for indefinite periods without deterioration from scaling. Sulphur compounds, however, cause rapid destruction of the highest grade alloy, and care must hence be used in the selection of fuel for furnaces where nickel-chromium alloys are in service.

While chiefly used for heat-resisting properties, these alloys have unsurpassed resistance to chemical attack and possess the advantage over stainless steel that no heat treatment or special preparation of the surface is necessary in order to develop full stainless qualities. Compared to stainless steel, these alloys offer greater resistance to those attacking agents upon which stainless steel has established its reputation than does this material itself.

Plating with Chromium

The useful properties of chromium have led to experiments on the production of protective coating of chromium on other metals, of which the most promising is chromium plating by electrolytic deposition. This has been successfully accomplished in this country and abroad, although the process has not yet reached commercial stages. The coating is hard, white, resembling platinum, polishes well, and has withstood successfully uses where other metals have failed. It resists the action of ammonia fumes, hydrogen sulphide, nitric acid, and is not attacked by molten zinc, tin or brass. From its non-corrodibility in vegetable and fruit acids it should make a satisfactory plating for tableware, high-grade cutlery, etc., its hardness giving such articles excellent wearing qualities.

To Discuss Steel Construction with Building Officials

The Building Officials' Conference will hold its tenth annual meeting at the Brown Hotel, Louisville, Ky., April 8, 9, 10 and 11. The association consists of building officials from cities throughout the United States and Canada. The American Institute of Steel Construction is a contributing member, and a joint session of the two bodies will be held on Thursday morning, April 10. L. H. Miller, chief engineer of the steel construction association, will present and discuss its standard specification.

Production of Pig Iron in Canada

The production of pig iron in Canada during February amounted to 60,266 long tons, or a decline of 3414 tons from the amount made during January. The output of basic iron increased 32 per cent over the previous month. The tonnage of foundry iron reached a high total for the present month showing 19,126 tons. The production of ferrosilicon was 2689 tons, a decline of 7.6 per cent below January. The output consisted entirely of the grade containing low silicon content. During February the labor difficulties of the British Empire Steel Corporation, Sydney, N. S., were settled and two additional blast furnaces were blown in there, making a total of seven furnaces in blast as follows: Two at Sault Ste. Marie, two at Hamilton, Ont., and three at Sydney, N. S. Pig iron prices at the end of February were unchanged from those of the previous month. No. 1 (2.25 to 2.75 silicon), $29.15; malleable, $29.15; No. 2 (1.75 to 2.25 silicon), $28.15; Toronto, and basic pig iron was quoted at $26, furnace.

The total production of steel ingots and castings in Canada during February amounted to 70,953 tons.

Favorable Business Conditions Reflected in Coal Consumption

The National Association of Purchasing Agents states that, based on its survey of coal consumed for industrial purposes, the total volume of business was on the same level for the past two months, and the indications are that when the statistics for March are compiled, that month will record further increased business activity. The momentum gained thus far this year makes the outlook favorable for continued activity during the second quarter.

Of the total number of reports received from consumers of industrial coal for February, 23 per cent indicated increases in business, 52 per cent remained stationary, and 25 per cent showed decreases as compared to the preceding month.

The following statistics are given:

Estimated Stocks On Hand	Net Tons
Dec. 1, 1923	75,269,000
Jan. 1, 1924	75,769,000
Feb. 1, 1924	75,507,000
March 1, 1924	74,708,000

	Production Net Tons	Estimated Consumption
November	51,075,000	39,720,000
December	47,062,000	35,029,000
January	57,992,000	42,650,000
February	53,355,000	39,441,000

(Of the February production, 45,708,000 tons was soft coal, and 7,647,000 tons hard coal).

The stocks of soft and hard coal in commercial consumers' bins on March 1, were approximately 799,000 tons smaller than on Feb. 1. Based on the rate of consumption in February the stocks on March 1 were sufficient to meet the industrial requirements of the United States and Canada for a period of 50½ days on the average.

MACHINE-TOOL CONFERENCE

Technical Sessions, Inspection Tour and Export Discussion Feature Meeting of Engineers

Two extremes of machine-shop activity, problems in judicious specifying of close limits on parts to be machined and the problems involved in the machining of huge sectional cast-steel hydraulic turbine castings weighing 288 tons, were part of a comprehensive program offered at the machine-tool conference held at the Engineers Club, Philadelphia, March 25. It was held under the auspices of the Engineers Club of that city, and the local section of the American Society of Mechanical Engineers with the cooperation of the machine shop practice division of that society.

The program included also an address and discussion on the training of apprentices, and for those interested particularly in the commercial side of the machine-tool industry, there was an address and discussion at the evening session relating to the export problem. During the morning more than 50 members and guests inspected the U. S. Destroyer Tender Dobbin, which is under construction at the Philadelphia Navy Yard.

Prof. W. H. Kavanaugh, University of Pennsylvania and chairman of the Philadelphia section of the mechanical engineers society, presided at the sessions. L. H. Kenney, Philadelphia Navy Yard and member of the meetings committee of the local section, took an active part in arranging the program.

The necessity of specifying manufacturing tolerances judiciously was discussed by B. H. Blood, general manager Pratt & Whitney Co., Hartford, in a paper on "Some Limitations on Manufacturing to Close Limits," which was published in part in THE IRON AGE of March 27. That close work is expensive and that tolerances should be set only after a careful study of their necessity and cost were emphasized. The specifying on drawings of tolerances that cannot be checked was also taken up and some principles to be observed in establishing tolerances were stated. Interesting examples of close measurements which have been made and some which could not be made at any reasonable cost were given. Mr. Blood also explained interferometer measurements briefly. Discussion following the paper centered on pressure as affecting the measurement of thread gages; accuracy of measurement of micrometers with ratchet stop; and indicating gages for turning work. The unilateral and bilateral system of unit tolerances was briefly discussed and in this connection Mr. Blood said that preferences should be given to one or the other according to conditions.

Machining Large Hydraulic Turbine Casings

The methods used in machining the large steel casings for the two 70,000 hp. vertical shaft type hydraulic turbines recently installed at Niagara Falls were set forth in a paper on "Machining Massive Parts of the World's Largest Prime Movers," by E. J. Armstrong, assistant engineer of plant, William Cramp & Sons Ship & Engine Building Co. Because of the illness of Mr. Armstrong, R. B. Ferguson of the same company read the paper.

The casings are of spiral or volute form having 14 ft. diameter water inlet and gradually reducing in size to about 4½ ft. at the last guide vane. The width across the casing is 47 ft. 2 in. at the widest part and 38 ft. across at the narrow part. The greatest height at the inlet flange is 15 ft. 8 in. The casing is made up of 18 sections and the total weight when assembled ready for boring was 576,000 lb.

The casings were bored to receive the head covers to approximately 18 ft. 7½ in. and faced on the top and bottom internal flanges to 19 ft. 6 in. diameter. The height from top to bottom flanges was 6 ft. By removing some of the sections near the 14 ft. inlet, the maximum radius of the casing was reduced to 21 ft.

The casing was set up centrally over a boring mill table, and supported in a horizontal position on stationary stands located on the shop floor around the boring mill table. The boring and facing tools were revolved by means of suitable tool posts and slides secured to the revolving table.

An extension vertical boring and turning mill having a swing of 20 ft. diameter with housings in the forward position and 33 ft. when moved back was employed. The height under the toolholders when the crossrail is in its highest position is 15 ft. The crossrail and housing not being required for the boring and facing operation, they were moved to the back of the machine. The 50-hp. driving motor and gears for rotating the table were located in a pit at the rear of the machine. The boring mill table was 18 ft. 8 in. in diameter and the finished bore of the casing about the same size.

The casing was mounted on cast iron pedestals which rested on a concrete floor surrounding the machine. Two 2½ in. set screws at the top of the pedestals were used for leveling up the work and large anchor bolts screwed into socket nuts in the concrete floor were employed for clamping and steadying the work. The casing was further supported and clamped to the cast iron extension bed or tracks for the movable housing.

Two cutting tools were used at a time, one working at the lower and one at the upper part of the casing. They were held in toolholders attached to a vertical feeding saddle sliding on tool-post columns bolted to the revolving boring mill table. The amount of metal removed varied from ¾ to 1¾ in. on a side, the average depth of cut when roughing out the bore was ⅜ in. and the feed 3/32 in. The cutting speed was 30 ft. per min. All cutting was done dry, using high-speed-steel tipped boring and turning tools. The time consumed in boring was 175 hr. per casing, 47 hr. being consumed in setting up and dismantling the work.

Surfacing the Flanged Joints a Problem

The surfacing of the many flange joints of the casing was also a problem requiring study in order to meet delivery dates as well as to keep down costs. The casing has nine radial and 15 longitudinal joints. The width of the flange-joint surface varies from 8½ to 10¾ in. and the flange thickness from 3 to 4¼ in. The machining of the flange joints was solved by constructing extra heavy face milling cutters, capable of milling the steel castings with a depth of cut from ⅜ to 11/16 in. A milling head was constructed, the spindle being driven by a variable speed motor through worm and spur gearing. Two separate motors, one for the vertical and one for the horizontal travel, were used for feeding the milling cutter to the work. Many parts to be faced were circular and milling feeds were arranged so that the face milling cutter could be fed around a circular path. The machine was said to be capable of surfacing a piece 17 x 22 ft. without resetting.

Cutters found to give the best results were those made with an extra heavy, hardened steel body, with inserted high-speed steel blades ¾ x 1¼ in. in section. Cutter heads with blades set at an angle were said to have proved to be much more economical than those with blades set parallel with the axis.

Special machining methods were also required for the cast-steel casing for the Johnson hydraulic valve and another machining feature described was the drilling, boring, spot facing, and tapping of the large bolt holes required for bolting the cast steel sections together at the flange joints.

Written discussion of Mr. Armstrong's paper by W. M. White, Allis-Chalmers Mfg. Co., Milwaukee, was read. It described some of the methods used in the Allis-Chalmers shop in 1921 in connection with the machining of parts for the 40,000-hp. turbines of the Pacific Gas & Electric Co.

Apprenticeship Training Discussed

A brief but forceful address on the need for training apprentices was made by J. A. Smith, general superintendent General Electric Co., Schenectady. The danger of specialization was pointed out and the need for skilled mechanics and men for supervisory positions emphasized. All large metal manufacturing companies should carry a large proportion of apprentices, said Mr. Smith, and for those who could not conduct such a system it was suggested that the young men in their employ should be kept moving around to various jobs in the shop. Paying young men enough to live on while they were apprentices was also urged, and the need of a differential between the pay of the skilled mechanic and

that of the specialized worker was called to attention.

B. H. Blood, Pratt & Whitney Co., also pointed out the growing scarcity of trained men, saying that many apprentices are now going into salesmen's jobs. He advocated an intensive training course, based on the proper selection of boys, an intensive training of one year being considered to make better workmen than many of the usual courses which are much longer. The difficulty of getting instructors for the training of apprentices was also brought out, as well as inculcating "pride of craft" and paying of apprentices according to their skill.

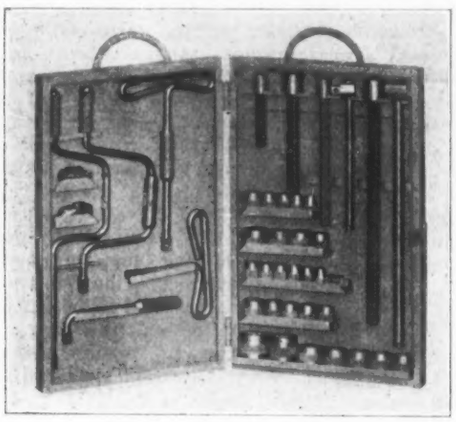
The inspection of the U. S. Destroyer Tender Dobbin, which will be placed in commission in a few months, was made in small groups, conducted by naval officers. This ship is designed to meet the ordinary demands for service, supplies and repairs for a group of 18 destroyers for a period of 60 days under wartime conditions. The necessary shop facilities for this duty are being installed and include a foundry with a 1½-ton cupola, non-ferrous melting furnaces, core oven and other equipment; pattern shop with woodworking machinery; forge shop with power hammers; sheet metal shop, coppersmith, torpedo and electrical shops. The machine shop is a feature. The different shops are arranged for the most convenient handling of work from one to the other. The ship was inspected thoroughly and the various features explained at length by the officers conducting the parties.

Dinner at the Engineers Club was followed by the evening session which was devoted to "Machine Tools—the Export Problem," an address under this title being made by W. H. Rastall, Department of Commerce. An abstract of Mr. Rastall's paper is given elsewhere.

Plant Maintenance Tool Cabinet

The Motor Tool Specialty Co., 14 East Jackson Boulevard, Chicago, has placed on the market the cabinet of "snap-on" interchangeable socket wrenches illustrated, which is intended for use by the engineers of manufacturing plants. Compactness, wide range of utility, and ready portability are features.

The cabinet is made of sheet metal, finished in olive green enamel, and is 21 in. high, 13½ in. wide and 2¾ in. thick. Equipped with tools it weighs about 25 lb. It contains all the standardized types of socket wrench speed handles, both light weight and heavy



weight. It also contains extension bars so that various lengths of shaft of any type handle may be quickly made. There are 18 hexagon sockets in the cabinet, ranging from 7/16 to 1 7/16-in. opening and taking nuts ranging from ¼ to ⅞-in. U. S. Standard. In addition there are nine square sockets, taking all sizes from ⅝ to 1-in. U. S. Standard. The "snap-on" interchangeable principle whereby all sizes of sockets may be interchanged on the nose of each type of handle, together with special ratchets and universal joint attachments, makes possible over 500 standard wrench combinations. This principle is emphasized as invaluable when it is necessary to reach inaccessible nuts for emergency repairs.

Synthetic Iron from Tin Plate and Steel Scrap

A cooperative agreement has been arranged between the British Columbia Bureau of Mines and the Department of the Interior whereby the Northwest Experiment Station of the United States Bureau of Mines at Seattle, Wash., will assist the first-named organization in establishing the best conditions for converting steel scrap, tin plate scrap, and sponge iron concentrates into foundry iron and steel, through the medium of the electric furnace. The expense of this investigation will be borne by the British Columbia Bureau of Mines.

This work is a continuation of the laboratory work on synthetic iron previously done at Seattle by the Bureau of Mines. It is expected that the results will be applicable to the production of gray iron from sponge iron. The tests will include observations on the relation of charge to product, methods of controlling the composition of the product, power consumption, costs, etc. The furnace is of the Greene (Heroult) type 3-phase, acid-lined, and of 3000-lb. capacity.

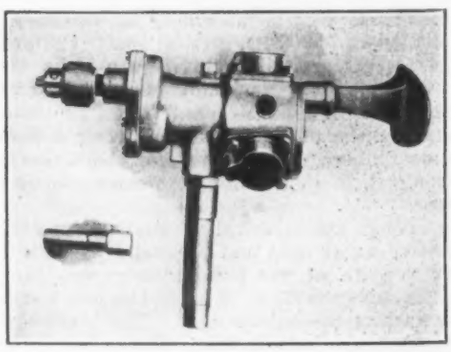
To Limit Use of Wooden Cars

WASHINGTON, April 1.—The bill of Senator Harris of Georgia, prohibiting the placing of wooden cars in front of or between steel or steel underframe cars in passenger trains in interstate commerce was passed by the Senate last Friday and was sent to the House. The law would become effective 30 days after approval by the President.

Lightweight Pneumatic Drill

A lightweight non-reversible pneumatic drill known as size D, drilling up to 9/16 in. diameter holes, and reaming up to 5/16 in. diameter, has been added to the line of the Ingersoll-Rand Co., 11 Broadway, New York.

The drill may be fitted with either breast plate, feed screw or grip handle and made adaptable for a wide variety of work. The construction is similar to that of the company's No. 6 and 600 drills for drilling up to



⅝ in. diameter. The features of this type of machine include the lightweight aluminum case, with steel bushings cast in all the bearing holes and the throttle hole; cast iron cylinders which are renewable and interchangeable, and special three cylinder motor. Accurate balance of the rotating parts of the motor is intended to eliminate vibration and reduce wear on the machine. All parts are accessible for inspection.

Working speed of 700 r.p.m. at 90 lb. air pressure, is recommended. The length of feed, with feed screw, is 2½ in. The length overall, with breast plate and chuck, is 15 in. The weight, including breast plate and chuck, is 14 lb.

Machine for Marking Disk Flanges

A marking machine for stamping the size, number and trademark on the inner surface of the flanges of the disks that form the centers of disk-wheels for automobiles has been placed on the market by the Noble & Westbrook Mfg. Co., Hartford.

The stamp is in the form of a roll, 3 in. in diameter, having the permanent portion of the lettering in raised characters upon its periphery. The numbers and sizes appear upon separate segments that fasten into the periphery of the stamp roll, and are easily changed.

In the machine shown in the accompanying illustration the stamp roll is hidden by the work. The roll that is exposed turns idly upon its supporting stud and is for

Machine for Stamping Size, Number and Trademark on Automobile Disk Wheel Flanges

the purpose of applying the pressure necessary to sink the characters of the stamp roll into the work being marked. This pressure roll, with its stud, is mounted upon a horizontally sliding head that is operated to and from the work by means of a treadle and connected toggle lever, so that the amount of movement, and consequent pressure, is determined by the setting of the machine and not by the pressure on the treadle.

The stamp roll is driven through back-gears, having a 1 to 15 ratio, from the driving pulley in the rear of the machine. With a 3-in. diameter stamp roll a stamp 9 in. in length is available. The diameter of the stamp roll is, however, a factor of the work and in this case could have been increased to 6 in. if desirable, with a correspondingly increased length of stamp.

The stud upon which the work hangs is adjustable for various diameters, and by changing this stud other disks or pieces similar to disk wheels can also be marked on this machine. The machine occupies a floor space of 3 x 4 ft. and weighs approximately 500 lb.

Heat-Treating Gray Cast Iron in Germany

Further information concerning the heat treatment of gray cast iron is contained in an article in *Stahl und Eisen* for Jan. 31 by Dr. E. Schuz. A new phase of this subject was discussed in THE IRON AGE of Jan. 3, 1924, in an article entitled "Tying Knots in Gray and White Cast Iron."

A brief abstract of the German article referred to states that the author, having found in previous experiments that pearlite in gray cast iron can be destroyed and converted into ferrite by heating for 24 hr. up to 600 deg. C. or for 3 hr. up to 650 deg. C., conducted further experiments at 800 deg. C., which is the temperature at which the reheating furnaces at the plant with which he is connected are generally kept by the lignite fuel used, and which is also above the Ac_1 point. He finds that thin-walled small boxes need only be heated for a short time up to 800 deg. They should then be cooled slowly to 600 deg. and be taken out of the furnace, enabling this to be charged three times a day. Whether the high temperature is maintained for minutes or hours does not matter, states the author. The essential thing is the cooling through the Ar_1 range which, for pieces of 3 mm. wall thickness, should not exceed a rate of 3 deg. C. per min.

Plans for Machinery Exports

Trade Information Bulletin No. 212 of the industrial machinery division of the Department of Commerce traces the machinery exports of the United States over a series of years and analyzes some of the leading markets, particularly with reference to the 1924 prospects. It is shown that the year 1920 was the best ever experienced by the American machinery export trade, the outgoing movement having exceeded $324,000,000. This dropped in 1921 and 1922 to $209,000,000 and $112,000,000 respectively. The bulletin takes the view that the worst of the depression is over and that the machinery exporter whose business has been diminishing since 1920 may now look for it to expand. Conditions are stated to be on the mend in almost all of the markets outside of Europe, while even in Europe there is reason to anticipate better times.

Tidewater Steel Corporation Plans

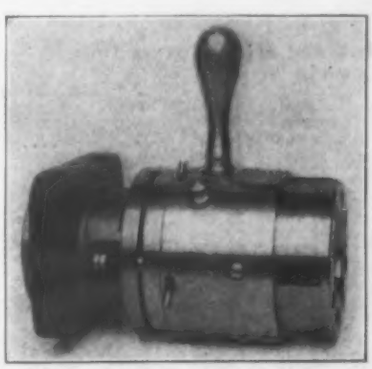
Reuben S. Baldwin, general manager, Maryland Steel Rolling Co., Fidelity Building, Charles and Lexington Streets, Baltimore, has announced that the Tidewater Steel Corporation, recently incorporated in Delaware with a capital stock of $1,500,000, soon will begin the construction of a plant at Hagerstown, Md. The new corporation, according to announcement, also has acquired, through an exchange of stock, the Maryland Steel Rolling Co.

The annual capacity of the Hagerstown plant will be from 30,000 to 50,000 tons of steel bars to be made from scrap. Mr. Baldwin will be in charge of the sales.

Among the directors are M. David Petine of Baltimore, D. D. Mallory and John S. Dashiell.

New Die Head for W & S Turret Lathes

The Eastern Machine Screw Corporation, New Haven, has placed on the market a modification of its style CC heads especially for use on Warner & Swasey 2-A and 3-A turret lathes. The new head is equipped with a special tool holder to fit the hollow hexagon turret of these machines, the holder being designed so as to bring the die head close to the turret with a minimum amount of overhang.



The adjustable pull-off is a feature emphasized by the makers. The operator does not have to advance the turret exactly in conformation with the lead of the screw cut, but simply follows approximately the feed of the head until approaching the point of tripping when the advance of the turret is stopped, and with the head continuing to advance, it opens at the proper point. It is claimed that the advance of the turret may be considerably behind the advance of the die head without affecting the lead of the thread cut.

Iron and Steel Exports Slump Again

Poorest Month Since October Caused by Decline in Purchases by Japan—Imports Heaviest Since August, but Below 1923 Average

WASHINGTON, March 31.—Decided dropping off of shipments to Japan accounts for the slump in iron and steel exports in February, when they amounted to 164,820 gross tons, valued at $19,708,217, as against 247,942 tons, valued at $28,644,840 in January. The comparatively small export movement in February is accepted as being indicative of the rather circumscribed world markets at present for American iron and steel, as well as a reflection of the dependence domestic producers have had to place upon a single country to develop a sizable volume of outgoing shipments, Japan having been an important factor by reason of heavy purchases made for purposes of reconstruction.

Imports of Iron and Steel Into the United States
(In Gross Tons)

	February		Eight Months Ended February	
	1923	1924	1923	1924
Pig iron	35,793	15,482	476,774	99,707
Ferromanganese	7,741	2,908	79,258	46,656
Ferrosilicon	1,493	1,939	12,982	7,440
Scrap	13,686	5,207	149,439	56,181
Steel ingots, blooms, billets, slabs and steel bars	2,057	3,748	21,665	20,797
Rails and splice bars	1,827	4,741	13,847	20,594
Structural shapes	468	1,005	7,417	9,041
Boiler and other plates	5	521	1,496	2,567
Sheets and saw plates	210	198	676	2,383
Bar iron	84	314	7,444	4,150
Tubular products	215	4,382	1,448	7,185
Castings and forgings	177	301	696	1,733
Nails and screws	31	26	349	388
Tinplate	2,889	65	5,617	726
Bolts, nuts, rivets and washers	21	19	85	118
Wire rods	547	647	2,289	3,910
Round iron and steel wire	329	402	1,272	2,238
Flat wire and strip steel	104	274	448	1,314
Wire rope and insulated wire, all kinds	27	90	211	648
Total	67,704	42,269	783,413	287,786
Manganese ore	4,636	4,430	231,687	153,171
Iron ore	143,702	115,039	*1,276,694	1,669,577
Magnesite	8,720	7,344	66,070	30,597

*Revised.

Imports of Iron and Steel in Gross Tons
(Monthly Averages)

	Total Imports	Pig Iron	Ferro-alloys	Manganese Ore and Oxide*
1909 to 1913, incl.	26,505	†14,132	....	....
1914 to 1918, incl.	23,351	4,645	3,281	‡47,155
1919 to 1921, incl.	23,901	5,708	3,710	37,115
1922	59,545	31,954	9,117	31,204
January, 1923	120,078	83,935	5,120	829
February	67,704	35,793	9,234	4,636
March	106,197	72,344	9,030	12,799
April	77,903	36,371	7,221	14,071
May	75,885	39,764	10,482	12,734
June	68,019	30,033	12,794	36,138
Six months' average	85,964	49,706	8,980	13,535
July	53,464	19,760	12,381	23,824
August	45,439	14,564	7,334	23,026
September	36,611	8,353	9,744	35,175
October	29,882	9,349	9,372	16,842
November	26,364	9,299	5,073	14,790
December	27,009	12,355	2,307	12,003
Twelve months' average	61,217	30,652	8,343	17,171
January, 1924	26,675	10,587	3,033	23,081
February	42,269	15,482	4,347	4,430
Eight months' average	35,964	12,469	6,761	19,146

*Not included in "total imports."
†Includes ferroalloys.
‡Average for three years, 1916 to 1918 only.

While exports showed a decrease in February, imports during that month, aggregating 42,269 tons, valued at $2,397,468, represented the largest incoming movement since last August, when they aggregated 45,439 tons. When compared with January of this year, with a total of 26,675 tons, imports in February showed an increase of approximately 56 per cent. The gain in imports was due to heavier shipments of a number of important items, including pig iron, ferromanganese and semi-finished material, and was particularly marked with regard to rails and tubular products, while there was a slight decline in imports of structural material.

Exports of machinery in February were valued at $24,927,382, as against $27,362,653 in January. Machine tool exports in February were valued at $1,283,604 as against $630,733 in January. Imports of machinery in February were valued at $864,655, as compared with $836,533 in January.

Steel rails constituted the greatest item of export in February, the total being 27,502 tons, of which Japan took 10,632 tons. When compared with January, there was a marked falling off in such lines as black and galvanized steel sheets, exports of the former in February amounting to only 8080 tons as against 49,946 tons in January, while exports of galvanized sheets in February amounted to 6227 tons as against 12,376 tons in January. Shipments of black and galvanized sheets to Japan in February amounted to 3159 and 1529 tons respectively. Canada took 4149 tons of black sheets in February. Of tin plate exports, amounting to 21,853 tons in February, Japan took 4585 tons and Canada 2309 tons.

Of the 15,482 tons of pig iron imported in February, 8344 tons came from England; 3111 tons from Canada; 1345 tons from France; 1130 tons from Scotland; 1103 tons from British India; 275 tons from Germany; 100 tons from China, and 74 tons from Sweden. Imports of steel rails, amounting to 4741 tons, represented an unusually heavy movement of this kind. The shipments came into Pacific coast ports and Galveston, Tex. France provided the bulk of the steel rail imports, the

Exports, January, 1923, to February, 1924, Inclusive
(Gross Tons)

	All Iron and Steel	Pig Iron	Semi-Finished Material
*Average, 1912 to 1914	2,406,218	221,582	145,720
*Average, 1915 to 1918	5,295,333	438,462	1,468,026
Calendar year 1919	4,239,837	309,682	258,907
Fiscal year 1920	4,212,732	248,126	288,766
Calendar year 1920	4,961,851	217,958	216,873
Fiscal year 1921	4,168,619	129,541	82,549
Calendar year 1921	2,213,042	28,305	10,363
Fiscal year 1922	1,721,418	28,330	63,127
Calendar year 1922	1,986,297	30,922	107,201
January, 1923	123,190	2,482	12,259
February	133,902	2,786	9,357
March	163,920	2,881	14,066
April	177,471	1,844	14,863
May	203,389	1,848	16,859
June	171,183	2,960	12,278
Fiscal year 1923	1,816,329	31,891	137,757
July	168,558	2,966	8,357
August	161,426	3,117	11,232
September	172,499	2,148	12,610
October	152,511	3,294	13,442
November	186,956	3,198	16,347
December	177,844	2,750	11,073
Calendar year 1923	1,992,595	32,318	152,748
January, 1924	247,942	3,812	8,594
February	164,820	4,773	11,463
Eight months	1,436,543	26,058	93,118

Machinery Exports from United States
(By Value)

	*February, 1923	February, 1924	Eight Months Ended *February, 1923	Eight Months Ended February, 1924
Locomotives	$127,086	$259,185	$4,024,253	$3,010,422
Other Steam Engines	126,607	88,687	1,442,729	736,243
Boilers	15,449	150,756	908,058	1,346,205
Accessories and Parts	208,996	300,664	2,268,569	2,964,477
Automobile Engines	331,479	560,604	1,910,857	2,802,138
Other Internal Combustion Engines	98,254	378,849	2,598,335	4,180,277
Accessories and Parts for	223,068	327,293	1,798,348	2,284,385
Electric Locomotives	.....	.....	1,705,940	1,145,700
Other Electric Machinery and Apparatus	679,311	720,416	4,337,127	6,167,255
Excavating Machinery	162,392	152,389	886,110	1,239,232
Concrete Mixers	33,953	56,263	365,074	375,177
Road Making Machinery	61,912	42,212	301,509	661,986
Elevators and Elevator Machinery	226,822	210,184	1,703,401	1,445,172
Mining and Quarrying Machinery	611,898	929,815	4,898,437	7,595,408
Oil Well Machinery	427,458	470,676	2,954,997	4,732,520
Pumps	394,588	694,944	4,263,457	5,247,297
Lathes	29,041	88,360	462,106	918,921
Boring and Drilling Machines	18,409	21,255	347,706	478,664
Planers, Shapers and Slotters	6,558	32,082	170,542	183,694
Bending and Power Presses	23,705	14,849	121,149	313,866
Gear Cutters	11,276	20,887	95,102	208,513
Milling Machines	28,302	35,021	313,391	300,482
Thread Cutting and Screw Machines	36,328	53,889	190,868	471,165
Punching and Shearing Machines	7,062	8,908	91,420	104,362
Power Hammers	6,504	6,009	89,037	122,696
Rolling Machines	3,120	53,092	139,971	90,148
Sharpening and Grinding Machines	70,085	89,279	581,520	846,115
Other Metal Working Machinery and Parts of	418,129	295,399	3,979,229	3,032,527
Textile Machinery	992,931	597,211	6,541,773	5,536,729
Sewing Machines	477,429	722,486	5,672,705	7,094,337
Shoe Machinery	85,238	124,926	767,520	825,734
Flour-Mill and Gristmill Machinery	75,569	43,862	755,550	164,263
Sugar-mill Machinery	191,949	161,050	3,057,296	5,611,354
Paper and Pulp Mill Machinery	153,823	110,694	1,102,073	1,350,734
Sawmill Machinery	60,281	47,743	382,108	436,152
Other Woodworking Machinery	81,719	118,953	1,033,692	847,146
Refrigerating and Ice Making Machinery	266,677	1,258,061	1,294,148	1,449,944
Air Compressors	171,336	206,551	1,530,003	1,876,739
Typewriters	989,395	1,333,446	7,855,297	9,283,052
Power Laundry Machinery	64,958	60,278	621,490	641,095
Typesetting Machines	296,370	294,503	2,301,159	2,791,969
Printing Presses	325,805	505,728	2,818,613	3,397,461
Agricultural Machinery and Implements	2,788,587	4,415,527	20,819,010	36,350,989
All Other Machinery and Parts	7,396,099	8,864,391	62,252,268	75,038,482
Total	$18,805,957	$24,927,382	$161,753,947	$205,701,227

*Revised.

Exports of Iron and Steel
(In Gross Tons)

	February 1923	February 1924	Eight Months Ended February 1923	Eight Months Ended February 1924
Pig iron	2,786	4,773	22,358	26,058
Ferromanganese	6	2	430	2,086
Ferrosilicon	39	320	512	709
Scrap	2,647	10,378	23,156	63,687
Ingots, blooms, billets, sheet bar, skelp	7,733	7,898	68,238	61,079
Iron bars*	....	813	....	4,872
Steel bars	15,675	8,938	104,065	92,667
Alloy steel bars	53	198	1,896	1,677
Wire rods	1,624	3,565	11,453	32,039
Plates, iron and steel	10,492	8,656	60,800	65,282
Sheets, galvanized	10,379	6,227	63,229	65,856
Sheets, black steel	8,368	8,080	60,249	141,194
Sheets, black iron	698	564	6,754	8,084
Hoops, bands, strip steel	3,232	3,722	23,529	24,087
Tin plate, terne plate, etc.	5,609	21,853	42,721	119,485
Structural shapes, plain material	8,652	4,809	65,709	68,612
Structural material, fabricated	4,766	5,144	61,116	57,186
Steel rails	16,227	27,502	148,853	210,211
Rail fastenings, switches, frogs, etc.	1,963	3,735	24,420	31,385
Boiler tubes, welded pipe and fittings	12,708	19,638	106,267	148,641
Cast iron pipe and fittings	2,165	2,290	35,285	19,639
Plain wire	5,184	3,740	54,639	54,993
Barbed wire and woven wire fencing	5,333	5,493	51,996	44,939
Wire cloth and screening	112	87	1,183	1,520
Wire rope	753	261	3,698	3,322
Wire nails	2,130	1,382	20,003	42,329
All other nails and tacks	632	605	4,855	5,194
Horseshoes	90	176	814	721
Bolts, nuts, rivets and washers, except track	1,123	1,209	12,157	11,931
Car wheels and axles	1,547	1,017	10,807	14,762
Iron castings	842	909	6,640	6,770
Steel castings	123	676	1,151	3,851
Forgings	211	160	1,382	1,674
Total	133,902	164,820	1,100,365	1,436,543

*Separately reported since July 1, 1923.

Imports of Machinery
(By Value)

	Feb., 1923	Feb., 1924	Eight Months Ended Feb., 1923	Eight Months Ended Feb., 1924
Metal-working machine tools	$22,484	$31,040	$191,944	$267,474
Agricultural machinery and implements	218,457	167,810	1,530,730	1,570,648
Electrical machinery and apparatus	1,661	.....	8,132	.....
Other power generating machinery	200,095	30,481	1,167,838	452,924
Other machinery	181,211	470,449	1,613,487	2,246,680
Vehicles, except agricultural	191,907	164,875	1,114,285	1,619,349
Total	$815,815	$864,655	$5,626,416	$6,157,075

Exports by Countries of Destination
(In Gross Tons)

	February 1923	February 1924	Eight Months Ended February 1923	Eight Months Ended February 1924
Plates:				
Canada	7,517	6,806	43,375	48,051
South America	83	133	613	642
Japan	....	59	....	911
Cuba	....	29	....	476
Philippine Islands	....	17	....	518
Mexico	....	124	....	524
Galvanized Sheets:				
Canada	1,725	1,529	18,486	90,961
Cuba	997	571	4,102	6,608
Chile	....	55	....	1,603
Argentina	644	527	3,466	3,997
Philippine Islands	697	903	8,162	6,543
Central America	....	137	....	2,635
Japan	....	464	....	13,371
Mexico	449	178	3,498	3,609
Colombia	....	164	....	1,767
Black Steel Sheets:				
Japan	1,049	3,159	18,614	107,867
Canada	5,039	4,149	33,215	23,986
Argentina	997	56	2,554	772
Cuba	....	59	....	1,146
Philippine Islands	....	18	....	329
Tin Plate:				
Canada	1,915	2,309	12,788	19,726
Japan	2,115	4,585	14,484	38,789
Argentina	38	1,619	2,251	9,330
Uruguay	141	9	1,161	2,132
China	18	4,805	752	17,295
British India	3	4,040	192	....
Chile	44	29	346	1,840
Cuba	275	222	1,393	3,290
Mexico	219	550	1,795	1,983
Hong Kong	....	1,987	123	4,744
Italy	71	876	514	1,158
Barbed Wire:				
Cuba	....	392	....	5,476
Argentina	769	1,439	7,908	5,545
Australia	739	232	6,008	2,907
Mexico	....	64	....	2,674
British South Africa	....	165	....	3,039
Colombia	....	398	....	2,622
Brazil	939	1,401	9,892	9,099
Canada	484	8	2,595	1,961
West Indies	530	....	6,120	....
Steel Rails:				
Canada	2,093	965	11,925	43,911
Japan	10,042	10,632	58,779	78,956
Cuba	645	1,847	25,199	29,618
Chile	....	6,231	3,007	9,162
Brazil	359	245	2,311	5,422
Philippine Islands	....	191	5,189	3,432
Chosen	....	30	10,726	1,178
Honduras	1,456	661	5,997	2,562
Kwang Tung	....	2,081	....	12,594
Argentina	....	....	1,179	763
Mexico	331	4,201	4,624	5,428
Colombia	389	73	8,198	2,350
Galvanized Wire:				
Japan	277	221	3,287	15,787
Argentina	1,339	528	12,542	6,302
Canada	1,312	1,207	9,449	9,899
Australia	472	352	7,628	3,451
Brazil	656	474	5,491	6,916
Mexico	264	42	2,260	2,324
Cuba	49	116	1,143	1,560
United Kingdom	177	206	1,727	1,840
Chile	95	45	3,593	1,367

Sources of American Imports of Iron Ore
(In Gross Tons)

	February 1923	February 1924	Eight Months Ended Feb., 1923	Eight Months Ended Feb., 1924
Spain	47	10,883	50,711	98,065
Sweden	24,004	13,901	327,333	368,328
Canada	123	112	2,010	11,369
Cuba	33,339	35,614	425,788	410,342
French Africa	16,200	12,720	128,871	247,868
Other countries	59,989	41,809	341,981	533,605
Total	143,702	115,039	1,276,694	1,669,577

movement from that country being 2634 tons, most of which entered the port of Galveston. Steel rail imports from other countries for February were: Canada, 916 tons; Belgium, 870 tons; Germany, 254 tons; Netherlands, 59 tons, and England, 8 tons.

While a small item within itself, the imports of wire rods in February, amounting to 647 tons, were relatively large. These imports were distributed among the following countries of origin: Sweden, 413 tons; Canada, 198 tons; France, 28 tons; England, 6 tons, and Finland, 2 tons.

Machine Tool Exports

	February, 1924		January, 1924	
	Number	Value	Number	Value
Lathes	49	$88,360	44	$76,904
Boring and drilling machines	208	21,255	161	54,849
Planers, shapers and slotters	36	32,082	14	12,778
Bending and power presses	11	14,849	19	9,764
Gear cutters	16	20,887	18	24,340
Milling machines	31	35,021	31	32,072
Thread-cutting and screw machines	60	53,889	598	133,029
Punching and shearing machines	22	8,908	21	4,697
Power hammers	11	6,009	25	24,124
Rolling machines	8	53,092	5	8,600
Sharpening and grinding machines	270*	846,115	440*	123,797
Chucks for machine tools	2,593	36,544	3,142	25,474
Pneumatic portable tools	1,136	66,593	1,224	100,305
Total	4,451	$1,283,604	5,742	$630,733

*Includes number of external and internal grinding machines only; "other sharpening and grinding machines" are now reported by weight instead of number.

February British Steel Trade Less Favorable

Exports of iron and steel products from Great Britain during February fell below the figures for the previous month and show a considerable decrease from the record set by the month of December, 1923, when the exports reached 354,960 tons, while imports show an appreciable advance over those for January, acting commercial attache Butler cables the Department of Commerce. The exports in February total 330,523 gross tons; imports reached 190,434 tons, compared with 337,724 and 141,590 tons, respectively, for January. The products exported in less quantities in February were chiefly pig iron and ferroalloys, galvanized sheets, tin plate, steel bars, and rails.

New Steel Plant in South Africa

Plans are underway by the Dunswart Iron & Steel Works, one of the largest iron and steel industries in South Africa, for many extensions and improvements to its plans and properties in the Union of South Africa and upper Rhodesia. Work is now underway on the construction of the first unit of an iron and steel producing plant 100 by 110 ft. About 50,000 pounds sterling will be spent on improvements. Considerable equipment has already been furnished, including an electric steel furnace, sand blasting machines, a 10-ton overhead electric crane and three jib cranes. Additional machinery, which will all be electrically operated, will be purchased, to include grinders, roll-turning lathes, molding machines, hot saw and other equipment, as well as electric motors and new transformer station equipment.

Government Surplus Sales

Sealed bids will be received by the commanding officer of the Picatinny Arsenal, Dover, N. J., up to 10 a. m. April 23 on a large quantity of equipment and supplies. A large part of the surplus stock consists of machine tools and allied equipment.

Electric Furnace Refractories

"Refractories for Electric Furnaces" is the title of a pamphlet issued under the auspices of the American Electrochemical Society which contains much valuable information on this subject. This is the second edition of a booklet originally published as a report of the proceedings of the Electric Furnace Association, including the papers presented at one of its meetings, together with a stenographic record of a discussion which followed. This proved so popular that the board of directors of the American Electrochemical Society, which a year or so ago took over all the printed literature of the Electric Furnace Association, when this became merged with the electrothermic division of the society, decided to bring out a new edition.

The present, or second edition, differs from the original in that it contains a number of additions to bring the subject up to date, including, however, most of the papers printed in the first edition. There have been a few minor changes in the original papers and one of them on "Carborundum Refractories" has been completely rewritten. New papers, especially written for this edition are: "Aluminum Refractories for Electric Furnaces," by L. C. Hewitt; one entitled "Refractories for Electric Furnaces," by Clyde E. Williams, Bureau of Mines, and one contributed by the refractories department of the Norton Co., Worcester, Mass., also entitled "Refractories for Electric Furnaces." The pamphlet comprises 95 pages together with some charts.

Locomotive Grate Bars with Long Life

Grate bars, particularly for locomotives, having a notably long life, seem to have been successfully made. Bars made by a Canadian company, the Hull Iron & Steel Foundries, Ltd., Hull, Que., have been tried out by Canadian railroads, and some of the original sets which were installed over four years ago are reported still in service, having, it is claimed, already outlasted five sets of cast iron.

Some years ago the company initiated a number of experiments to produce a steel of heat-resisting qualities. The result of numerous trials was the production of an alloy steel casting known as "chromite heat resisting steel." Incorporated in the shape of grate bars this material has been patented and has been adopted as standard equipment on the Canadian National Railways. The steel company reports that considerable economy has been effected by their use. While the initial cost of the material is higher than cast iron, the physical properties are found to be so superior that grate bars can be made of considerably less weight, maintaining sufficient strength, with the added advantage of long life. It is calculated that the final cost is in effect only a little more than that of cast iron.

The producers state that they have already exported the bars to the United States, but as the tariff is almost prohibitive, negotiations are under way for the erection of a plant in the United States.

L. B. Miller's Ore Book

The loss in iron ore on ignition has been recognized in the Lake Superior iron ore analysis book issued by L. B. Miller, National City Bank Building, Cleveland. The ignition loss is made up largely of combined water, small amounts of carbonaceous matter and in some ores a little carbolic acid. These are not slag forming materials and as they are expelled by surplus heat in the furnace before fusion, they do not add to the furnace fuel cost. A table is provided giving the percentage of iron and other elements remaining after the elimination of moisture and ignition losses, or the elements with which the blast furnace operator has to deal in smelting this ore. It is pointed out that a definite economy is achieved, all other things being equal, by the use of ores high in ignition loss. Two ores are listed in the booklet, the Delta, a high phosphorus ore mined at Iron River on the Menominee Range and the Williams ore mined at Biwabik on the Mesabi Range.

New Annealing Practice for Tool Steels

Preliminary Heat Treatment by Electricity Instead of Fuel —Large Scale Commercial Operation Found Practical

BY ARTHUR T. CLARAGE*

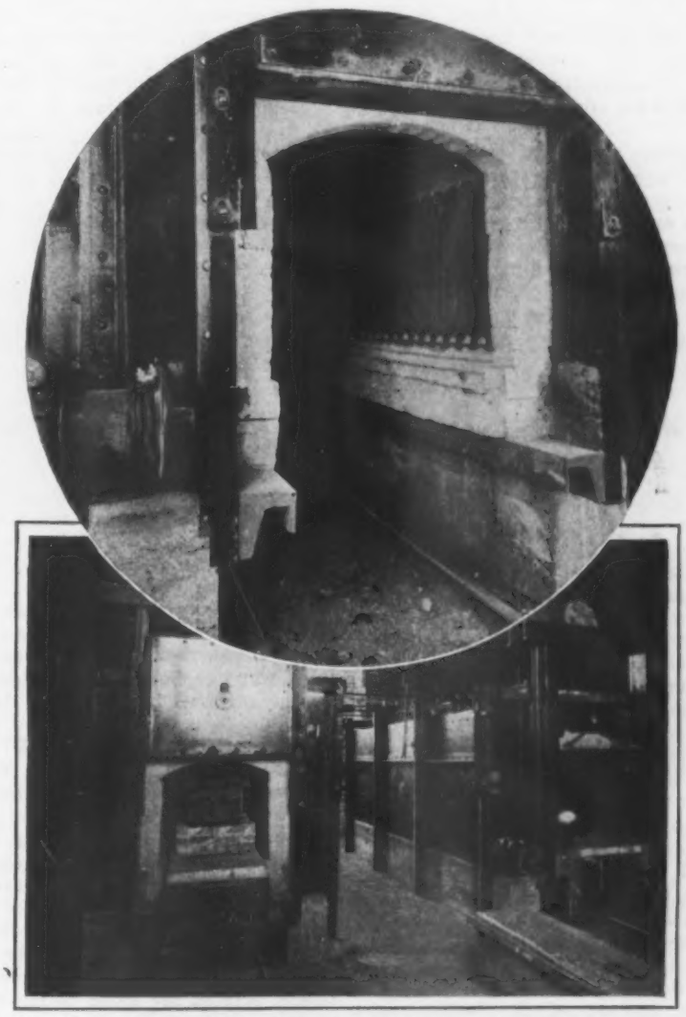
THE tool steel maker has long recognized the advantage of the application of electric heat for the heat treating of finished tools of fine steel. There is much gained in eliminating the defects of heating directly by fuel combustion in this work. Electricity not only offers the answer to these problems, but has additional advantages of outstanding importance, such as precision of control and minimizing of manipulation.

It would seem that the same advantages are to be gained from the electric process in preliminary heat treatment or annealing because, to furnish material which will respond uniformly to hardening heat treatment, it is desirable to deliver to the user bars of the utmost uniformity of structure. This is possible only by perfect heat treatment, subsequent to finishing.

Absolute control of structure is not entirely possible in the making of steel. This is governed partly by the factors such as size, mass, etc. Some of the fine steels are hammer-finished and some rolled. There are many advantages in the hammer finishing of this product, but exact uniformity is not possible. Similarly with rolled material —although uniformity is possible, the desired structure condition is affected by factors such as size, and character of material. It should be possible, however, to correct this by theoretically ideal heat treatment.

The use of fuel-fired furnaces for annealing involves a furnace of complicated design. A separate heating chamber must be constructed apart from the combustion chamber. The gases must circulate to an outlet or stack. This, in principle, is directly opposed to the one thing most desired in annealing, i. e., uniform temperature. With uniform temperature there can be no draft and circulation. Further, the use of fuel carries with it the danger of cold air infiltration, the ever-present tendency of the draft to pull cold air through holes which develop in the fire bed, etc. These factors are not of consequence under ordinary conditions, but in the handling of high-alloy and high-carbon sensitive steels they are of vital importance.

On first observation electricity seems to offer all the advantages here that it does in the hardening or heat treating of the comparatively small-sized tools. It completely avoids the use of the separate combustion chamber and stack. Heat may be applied directly by radiation and convection, and circulation may be eliminated. It should be possible completely to eliminate air infiltration.



The Heavy Construction (Upper) of the Car-Type of Electric Furnace Insures Efficient Insulation

A Box, Suitably Supported, Contains the Steel Bars for Annealing. A battery of these furnaces is in use

As the bulk of tool steel must necessarily be treated in bar length and form, the use of electricity offers another advantage. Long length and the close control desired do not go together where fuel is used, but this should make no difference with the electrical operation on account of the fact that the heat may be applied just where it is wanted.

Against these many advantages there are several difficulties encountered in the commercial application of large scale electric process. In the first place, the annealing of this steel is necessarily an inefficient operation in that it involves the heating and subsequent cooling of the furnace in which the work is done. There existed some doubt as to the cost of the electric operation. The B.t.u. cost is much higher, but whether or not this could be fully or partly offset by the different construction of the furnace remained to be answered. The furnace of the electric type could be constructed of material of much lower heat conductivity and absorption than one of fuel fire design.

In considering this cost item there was further question as to whether an increased cost would be warranted in the benefits that would accrue to the ultimate user and whether or not they could bear the cost of this. The only possible way of actually determining these many factors seemed to rest with an extensive experiment. For this purpose it was decided to go ahead with a trial operation of commercial size.

It was decided by the Columbia Tool Steel Co., Chicago Heights, Ill., to erect a furnace specially for

*General manager Columbia Tool Steel Co., Chicago Heights, Ill.

this, the first consideration of which was a matter of size. This involved the unit of operation. The larger operation offered economy and, on the other hand, the smaller operation approached the ideal. For the trial furnace, at least, it was decided to come as near the ideal as possible. A furnace of the following dimensions seemed to offer the largest operation possible without sacrificing any of the advantages to be gained: The hearth was constructed approximately 32 in. wide inside, 26 in. high and 16 ft. long to hold a container of 12 in. section by 14½ ft.

The furnace was built car type, as shown in the illustration, and provided for the supporting of the steel in a central position in the hearth. Resistance type metallic heating elements were placed on the sides of the furnace, so arranged as to give substantially uniform radiant heat in-put to all surfaces of the container. Apart from 7 small temperature testing pyrometer holes (plugged when not in use) the furnace was made absolutely tight. It was constructed of brick of low heat absorption and conductivity, and well insulated with heat resisting powder. To show the thickness of this insulation, it may be interesting to compare the over-all measurement of 6-ft. width and 7-ft. height with the hearth size.

For control of the electric current it seemed advantageous to buy high voltage and transform this ourselves. In this way, by the use of the transformer with variable taps and switch arrangement, it was also possible to get current to meet with almost any condition desired. Further, a pyrometer controlling device was installed to make the operation as nearly automatic as possible and to avoid the human element.

After completion experiments were conducted for some time to determine what could be done with the equipment. It was found to advantage to discontinue the use of the customary pipe in which the steel was packed, a box being much better in that it could be carefully packed with one bar upon another, giving much more uniform conduction. A box 12 in. x 14 in. x 14½ ft. inside is now used. The over-all efficiency proved very high and the power consumption so low that the cost is only a small amount more than coal.

The precision of control is most useful. For practical purposes the temperature may be maintained absolutely uniform. In actual operation the usual allowance for temperature variation may be entirely eliminated. The uniformity has a direct effect on the character of the steel resulting from this heat treatment. The trial results proved conclusively that all the advantages hoped for would be realized.

The bar produced is of a uniformity heretofore impossible. Different conditions produced by forging and rolling are corrected and the steel can be left in the best possible condition for machining. Further and more important, any or all parts of the steel so produced will respond uniformly to final or hardening heat treatment.

Reports from the trade on this material produced in the first furnace were so favorable that it was decided to increase the original trial installation to a complete battery. This unit, which is now in operation, is made up of a number of furnaces of the same design as the original.

In the face of the demands of the present time for economical production, quality of tool steel is assuming a new importance. It is felt that the commercial application of this process is a decided step in the right direction. Results so far plainly indicate this.

ACCIDENTS INCREASING

Decrease in Efforts at Prevention Since the War—Conference at Harrisburg

HARRISBURG, PA., April 1.—Revival of the safety organizations which helped to reduce accidents in industry materially during the war was urged here on March 26 at a safety conference held under the auspices of the Pennsylvania State Department of Labor and Industry. This session, which was held in the hall of the House of Representatives, was the last of a series of such conferences held in industrial centers of the State.

Governor Pinchot, who delivered the opening address, declared that industry has taken a greater toll of lives in peace time than have the machines of wars at other times. He made a plea that manufacturers, employers of labor and representatives of labor organizations cooperate in an educational program that will help reduce the appalling death and accident rate.

"Principles and methods of true conservation must be applied immediately in industry if humanity is to be saved from deterioration and destruction," said the Governor. The terrible wastage of the better race stocks in peace as well as war must stop. The preservation and betterment of man must be included in the conservation program as well as the economic utilization of his environment.

"For, while war has slain its thousands, industry has slain its tens of thousands. These useless killings and maimings must halt. It lies within the power of the owners, managers, superintendents, foremen and the rank and file of the workers in industry to reduce greatly or to eliminate in many occupations the toll of industrial death and disability. As an earnest conservationist I wish you all the success in your efforts to prevent all preventable industrial accidents and to reduce the number and severity of all accidents to the lowest possible minimum.

"Statistics showing the causes of accidents, morbidity and mortality, however, indicate that man needs to be taught conservation of himself even more than the conservation of forests, animals and vegetables."

Dr. Royal Meeker, Secretary of the Department of Labor and Industry, declared that accidents in Pennsylvania have been increasing steadily since 1921. During 1923, he said, the total number of accidents had increased from 16,933 in January to 17,970 in July, only to slump back to 14,417 in December. The total number of industrial accidents for the year, he said, was 200,435. That total was greater than for any year since 1917, when the total reached 227,800. Fatal accidents for 1923, however, were fewer than those of other years, which, he said, indicates that the more serious hazards in industry were being carefully watched and safeguarded.

The increase in accidents, Dr. Meeker stated, was traceable to a letdown on the part of employees in the efforts to prevent accidents. That work, he stated, reached its high water mark during the war, when "employers learned that capital investments to prevent accidents pay big dividends." He added: "Safety organizations built up during the war period were largely curtailed in the industrial depression that followed the war and have not been built up again."

"The workers and the industries are now paying the cost of this extravagant economy," Dr. Meeker continued. "Accidents can only be prevented by conscious, intelligent effort. Mechanical safeguards and safety devices are little better than perpetual motion machines unless the management and the workers are educated to use them properly."

Ninety per cent of all industrial accidents are preventable, said Gabriel H. Moyer, manager of the State Workmen's Insurance Fund. Thirty per cent are preventable by means of proper safeguards, while a little care and exercise of common sense will prevent another 60 per cent. Intelligence, he added, on the part of the workmen, foremen and managers would accomplish wonders in accident reduction.

There is a cause for every accident, he asserted, and it is up to the safety engineer and foreman to find it. He then cited numerous examples of accident prevention that have been undertaken by his bureau. Three cases of infection, he said, recently were discovered in a woodworking plant in the northwestern section of the State. A safety engineer was sent there, and discovered that the person administering first aid had very little knowledge of her work. The woman was replaced by an experienced nurse, and no further infections have been reported.

NEW DOUBLE DISK GRINDER

Hydraulic Feed for Operating Wheel Heads—Ease of Operation and Increased Production Claimed

A new double-spindle disk grinder the outstanding feature of which is the Oilgear hydraulic feed employed in operating the sliding heads has been placed on the market by the Gardner Machine Co., Beloit, Wis. Accuracy, ease of operation and simplicity of adjustment, are claimed and increased production is attributed to the nicety of control and relief from physical exertion provided by the hydraulic feed for operating the wheel heads.

Control of the feeding speed, which formerly has not been provided on machines of this type and control of grinding pressure, previously left to the operator, are among the advantages claimed for the hydraulic feed. Positive and dependable operation is also emphasised.

The sliding wheel heads are operated by a double-acting hydraulic cylinder mounted on the left-hand end of the base and directly connected to the sliding head on that end of the machine. Connection is made to the opposing head by means of rack and pinion. Oil pressure is applied to the cylinder by a variable-delivery Oilgear pump, which is mounted on the rear of the machine as shown. The pump is inclosed and self-contained and is driven either from an individual motor or from a countershaft. A control shaft for the pump which extends through the base of the machine to the front may be operated by a hand or foot lever. Adjustable stops on the control lever permit adjustment of the speed of travel of the sliding heads, this adjustment being varied according to the surface and the material being ground.

The grinding pressure available is in excess of what any wheel will stand and to protect the mechanism, two relief valves, one for the feed and one for the return motion, are incorporated. These valves are accessible and the feed valve may be set to give the proper pressure for each job. The distance which the grinding heads travel is regulated by a positive stop having micrometer adjustment. The stop is placed directly on the sliding heads and permits of grinding to close limits.

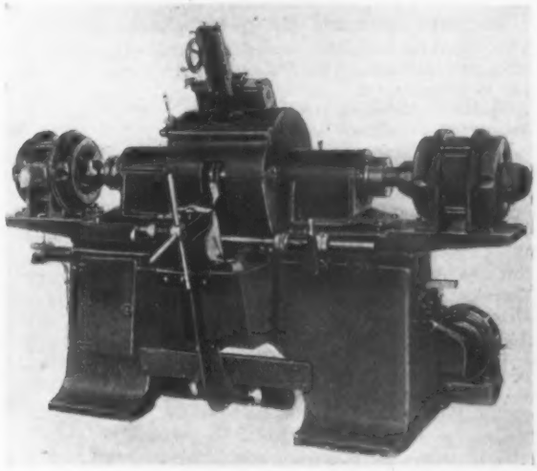
The grinding members, which are either 20-in. steel disk wheels faced with abrasive disks or 18-in. ring wheels carried in chucks, are inclosed by a hood having an opening at the front just large enough to permit the work to pass through. The hood acts as a guard for the wheels and also confines the dust or spray of grinding. The wheel truing device is carried in a horizontal slide mounted on top the hood and consists of a Ross dresser mounted in a gibbed vertical slide. The dresser is operated by a handwheel through a rack and pinion, and is always in position ready for immediate use, but does not interfere with the set-up or operation of the machine.

The grinding wheel spindles are of large diameter and are mounted in ball bearings of the deep groove-type, which are inclosed in dust proof housings and run in lubricant. The ways on which the grinding heads are mounted are wide and of large area, and are fully protected from dust and grit.

The work-carrying fixture is mounted on a swinging arm, which is counter-balanced so that little effort is required in its operation. This arm is hinged on a bracket bolted directly to the base of the machine, and the hinge shaft is carried in bushings which may be conveniently renewed. Attaching the arm directly to the base of the machine provides rigidity, and the hinge shaft being located under the base, it is away from grit and dirt. The long radius on which the fixture swings causes the work to travel on a nearly horizontal line as it passes to and from the grinding wheels.

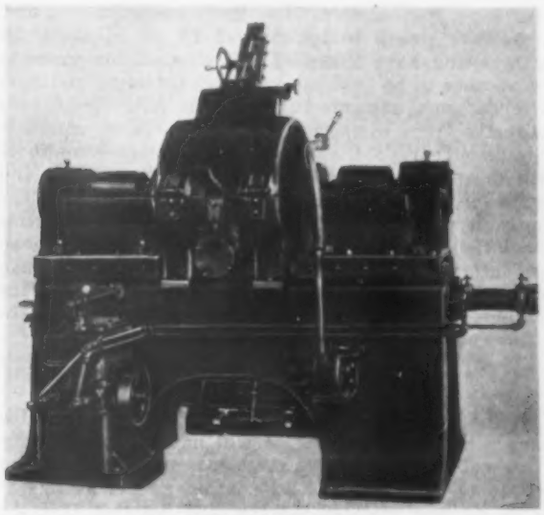
Work may be ground either wet or dry. Fixtures can be provided to accommodate a large variety of work and the machine is built in a number of ranges of opening between the grinding wheels. The machine is available in either belt or motor driven type, the latter being equipped with a 7½ hp. motor on each spindle. The motors are mounted on extensions of the sliding heads and directly connected to the machine spindles by flexible coupling.

In grinding of the ends of eyes on automobile leaf springs 2-in. in width with eyes 1 5/16-in. in diameter, production of about 400 eyes or 200 complete springs per hour is claimed. The machine is designated as the No. 27.



Hydraulic Feed for Operating the Wheel Heads Is the Outstanding Feature. Control of the feeding speed and the grinding pressure, and elimination to large extent of physical exertion of the operator are advantages claimed

The Variable Delivery Oilgear Pump Is Mounted at the Rear as Shown Below. The pump supplies oil pressure to the double-acting hydraulic cylinder which operates the sliding heads



The Whitin Machine Works, Whitinsville, Mass., until further notice will operate on a five-day per week schedule, remaining closed Saturday. Approximately 3000 employees are affected by the reduction in working hours. Other Massachusetts textile machinery makers report a marked falling off in the demand for their product. A year ago the industry was in a flourishing condition. The slump in business generally is attributed to the skyrocketing of raw cotton prices.

PRICE FIXING CHARGED

Officers and Members of American Malleable Castings Association Indicted

CLEVELAND, March 31.—The American Malleable Castings Association, long regarded as one of the most successful trade organizations from the standpoint of doing constructive work in behalf of improving the malleable iron industry and the quality of castings produced, is charged with being a price-fixing organization in an indictment returned March 27 against 47 of its members and R. E. Belt, its secretary-treasurer, in the Federal Court in this city, where the offices of the association are located. The malleable castings manufacturers and officers of their association are charged with the violation of the Sherman law. In each case involving a manufacturer the indictment is against both the company and one of its leading executives. It is stated that United States District Attorney A. E. Bernstein, in presenting the evidence to the Grand Jury, acted on the instructions of Harry M. Daugherty, late attorney general.

The indictment charges that during the past three years the corporate defendants have carried on an interstate business in malleable iron castings in accordance with an agreement to eliminate competition among themselves as to prices, terms and condition of sales and as to customers, and by agreement have from time to time fixed exclusive and noncompetitive prices to be charged by all of them for castings and have assigned and allotted customers to one another to be held as exclusive customers and have enforced such assignments by refraining directly or indirectly from competing for customers so assigned. It is also charged that in order to secure compliance with the terms of the agreements the defendant companies have maintained an organization, the American Malleable Castings Association, and have required this association to collect and receive from each of its members information as to details of each member's business and to distribute such information among all the members for their use in preventing breaches of the said agreements.

Denial of Association

If the Government has any evidence to back up the charges in the indictment, it will have an opportunity to present this when the case comes to trial, if it ever does come to trial. The association maintains that it has in no way violated the law and declares that the subject of prices has never been discussed at any of its meetings or that there has ever been an attempt to allocate customers for malleable castings. In addition to the charge of price fixing the action brings up the subject of the rights of a trade association to collect statistical data and distribute it among its members.

The American Malleable Castings Association has 60 members, but for some reason or other 13 escaped being indicted. The indictment is not confined to foundries that engage wholly in general foundry work, but takes in plants that make pipe fittings, saddlery hardware, agricultural implement castings, chain and various specialties, although most of the specialized plants at times do some jobbing work. Some of the members who do only commercial jobbing work were not indicted. With plants specializing on different types of castings for various fields, there evidently cannot be as much competition with each other or the opportunity to enter into a general conspiracy to eliminate competition, were the companies so disposed, as there would be were they all serving the same class of trade.

The indictment charges that the 47 defendant companies make approximately 500,000 tons of malleable castings annually or 75 per cent of all made in the United States. This statement as to percentage is disproved by the Department of Commerce, which credits the entire membership of the association with producing only about 55 per cent of the malleable castings made. The total number of malleable foundries in the country including those belonging to the association is about 200.

Money Spent for Research

The association of manufacturers of malleable castings was formed to improve the product of its members and in the ten years of its existence it has spent $500,000 in laboratory and metallurgical research work and it is stated that over 80 per cent of its income has been spent for that purpose. A permanent laboratory has been maintained for a number of years at Albany, N. Y. Since this work was started, the records of the association show that the quality of malleable castings made by the members has been so greatly improved that at present the average ultimate strength is now 54,339 lb. per sq. in. as compared with 30,000 lb. ten years ago and in the same period the average elongation has been increased from 7 to 17.7 per cent. In addition to its metallurgical work, the association has devoted much time to the study of plant practices involving the solution of various practical problems with a view of improving foundry methods and it has given considerable attention to the working out of a uniform foundry accounting system.

The Companies Indicted

The companies named in the indictment are:

The Eastern Malleable Iron Co., also trading as the Bridgeport Malleable Iron Works, Bridgeport and other points in Connecticut.
Naugatuck Malleable Iron Works.
Troy Malleable Iron Works.
Wilmington Malleable Iron Works, Vulcan Iron Works, all in Connecticut.
Albany Malleable Iron Co., Albany, N. Y.
Albion Malleable Iron Co., Albion, Mich.
Badger Malleable & Mfg. Co., South Milwaukee, Wis.
Belle City Malleable Iron Co., Racine, Wis.
Chicago Steel Castings Co., Chicago.
Danville Malleable Iron Co., Danville, Ill.
Decatur Malleable Iron Co., Decatur, Ill.
Thomas Devlin Mfg. Co., Philadelphia.
Erie Malleable Iron Co., Erie, Pa.
Federal Malleable Co., West Allis, Wis.
Fort Pitt Malleable & Pennsylvania Gray Iron Co., Pittsburgh.
Frazier & Jones Co., Syracuse, N. Y.
Illinois Malleable Iron Co., Chicago.
Iowa Malleable Iron Co., Fairfield, Iowa.
Kalamazoo Malleable Iron Co., Kalamazoo, Mich.
The Kennedy Corporation, also trading as the Baltimore Malleable Iron & Steel Casting Co., Baltimore.
Laconia Car Co., Laconia, N. H.
Lake Side Malleable Castings Co., Racine, Wis.
Lancaster Foundry Co., Lancaster, Pa.
Marion Malleable Iron Works, Marion, Ind.
Meeker Foundry Co., Newark, N. J.
Moline Malleable Iron Co., St. Charles, Ill.
Northern Malleable Iron Co., St. Paul, Minn.
Northwestern Malleable Iron Co., Milwaukee, Wis.
Pittsburgh Malleable Iron Co., Pittsburgh.
Rhode Island Malleable Iron Works, Hills Grove, R. I.
Rockford Malleable Iron Works, Rockford, Ill.
Ross-Meehan Foundries, Chattanooga, Tenn.
St. Louis Malleable Casting Co., St. Louis.
Standard Wheel Co., also trading as Standard Malleable Castings Co., Terre Haute, Ind.
Stanley G. Flagg & Co., Inc., Philadelphia.
The Stowell Co., South Milwaukee, Wis.
Temple Malleable Castings Co., Temple, Pa.
Trenton Malleable Iron Co., Trenton, N. J.
Vermilion Malleable Iron Co., Hoopeston, Ill.
Wanner Malleable Castings Co., Hammond, Ind.
Wisconsin Malleable Iron Co., Milwaukee, Wis.
Union Malleable Iron Co., East Moline, Ill.
National Malleable & Steel Castings Co., Cleveland.
Dayton Malleable Iron Co., Dayton, Ohio.
American Malleable Castings Co., Marion, Ohio.
Columbus Malleable Iron Co., Columbus, Ohio.
Springfield Malleable Iron Co., Springfield, Ohio.
Zanesville Malleable Co., Zanesville, Ohio.
Warren Tool & Forge Co., Warren, Ohio.

A booklet on "Industrial Loans" has been published for general distribution under the authorship of Clinton E. Woods, of Clinton E. Woods & Co., industrial engineers, 1421 Chestnut Street, Philadelphia. The object of the monograph is to minimize the element of chance for both the industrial plant and the lending bank.

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ESTABLISHED 1855

THE IRON AGE

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The Steel Corporation in 1923

THE Steel Corporation made a much better showing for 1923 than for the preceding year both in total earnings and in earnings per ton, but 1922 had been a particularly poor year. As noted in THE IRON AGE of March 29, 1923, in a reference to the annual report for 1922, from 1921 to 1922 the corporation's production increased 50 per cent, but the earnings per ton decreased 27 per cent, or from $11.65 to $8.52, showing how important are influences other than operating rates in affecting earnings.

The apparent earnings per ton in 1923 were $12.50. The figures are comparative, not absolute, for there are earnings other than those made on the steel products sold, but it makes a very convenient comparison to divide the shipments of steel into the earnings. For the computations just made the earnings are taken after payment of subsidiary company bond interest, the net being $179,646,674.

From 1922 to 1923 the corporation's coal production increased 51.5 per cent, coke production 42.3 per cent and pig iron production 39.1 per cent, the differences in percentage increase reflecting chiefly the fact that in 1922 the corporation had purchased large quantities of coal and smaller quantities of coke. The steel ingot production increased 26.4 per cent, the difference between pig iron and steel increase reflecting exhaustion of pig iron reserves in 1922 and replenishment in 1923. Output of steel products in the form in which sold increased 24.9 per cent. The difference suggests a slight accumulation of semi-finished steel, this being confirmed by the inventory, which shows a small decrease in ingots, but an increase of $10,400,000 in semi-finished steel and skelp.

The output of rolled products for sale was 14,721,469 tons, while shipments were 13,196,298 tons domestic and 1,177,524 tons export, a total of 14,373,822 tons, or about 350,000 tons less than production, while the inventory increased $11,000,000 in finished products. Part of the increase in inventory in semi-finished and finished was due to higher costs and part to the increased tonnages.

In the past five years the Steel Corporation has operated at higher percentage rates of capacity than the independents. In the early years the tendency was rather the other way. The corporation's efforts have been directed chiefly to building up good-will and improving its methods and equipment, to reducing cost rather than to increasing the tonnage capacity. Since the war started the corporation has increased capacity about 15 per cent, while the independent capacity has more than doubled.

In round figures, the country's steel ingot capacity may be set at 35,000,000 tons on Aug. 1, 1914, and at 54,000,000 tons at the present time, the corporation's proportion of capacity having decreased from about 57 per cent to about 42 per cent. In 1913 the corporation made about 55 per cent of the ingots, but lately its proportion has been running thus: 1919, 51 per cent; 1920, 47 per cent; 1921, 57 per cent; 1922, 46½ per cent; 1923, 47 per cent.

Thus the corporation has lost little in trade position by refraining from making large increases in capacity like the independents. There have been heavy expenditures, but they have been in improvements rather than extensions.

During the war the corporation set up an inventory reserve, to take care of apparent losses in inventory if or as values should shrink. This reserve reached its maximum, $95,000,000, at the end of 1920. It performed its function in 1921 and 1922, at the end of 1922 standing at $49,460,082, but in 1923 it increased a trifle, being now $51,220,055.

DUE to the heavy movement of various steel products to Japan in January, there was a marked rise in the total of American steel exports. The small volume in February, analyzed in detail elsewhere, is in striking contrast. At more than 239,000 gross tons, the January exports were close to the monthly average of 241,000 tons in 1913. Not in 34 months had our exports approached this figure. But February with only 164,600 tons fell below the monthly average for 1923. Japan's reconstruction needs took in January large quantities of plates, galvanized sheets, black sheets, tin plate, rails and wire products, running to 93 per cent of the black sheet, over 83 per cent of the wire nail and over half the rail exports for that month. The respective quantities in February are

small by comparison. The spurt in January was good while it lasted, but the February reaction is another reminder of the large extent to which, under ordinary conditions, our steel exports have been dependent upon Japanese demand—that and the needs of our neighbor to the north, whose steel industry is still far short of full diversification in finished products. South America is a natural outlet for American steel, but purchasing power there grows but slowly and Germany and western Europe will continue to be alert competitors.

A Time to Use Common Sense

THE mania for investigation and scandal-mongering which has Congress in its grip is responsible in part—perhaps almost wholly responsible—for the hesitation of iron and steel buyers which became manifest in early March; but it remained for the threatened bonus raid on the Federal Treasury to accent the decline in the late days of the month. With so many other factors favorable, even brightness in Europe, a return to sanity at Washington, if not too long delayed, would undoubtedly bring a rebound in business. The heavy orders for steel in January and February represented in no small part restocking after the limited buying of fully six months, and now some halting for the process of digestion is natural. But the present check has other features that are to be regarded as more or less a reflex of what is happening at Washington. Senators and Representatives just now seem as incapable of deliberative and constructive action as an Indian lodge when the mania of its war dance is on. Sensible people in the districts and States from which these members and Senators come should sharply tell them that the slumming expedition must stop long enough at least for the passing of the tax reductions for which the country and the President have called, and which industry must have if the present scale of operations is to be maintained.

Trade Forecasts and the Outcome

ASTRONOMERS were perhaps the first to measure "personal equation," determining the amount of time by which a given individual was disposed to anticipate or to lag in recording an event such as the passage of a star's image over a transit wire. Similarly business men try to measure, for instance, how much their natural judgment is likely to run above or below the true value of an article.

If a beginner, observing a star's transit, is slow by say two-tenths of a second and is then informed of the fact he is likely to modify his actions and in an effort to correct his error he may even anticipate. In this as in other things the response to a stimulus will change with the acquisition of additional knowledge.

The course of business or trade, with its ups and downs in volume of activity and its fluctuations in prices, represents a series of responses by the crowd to a series of influences. In psychological parlance all these influences would be called "stimuli," but in the vernacular the word is inconvenient, and "stimulants and depressants" is a more descriptive designation.

In recent years we have been studying economics more or less and we certainly have given much attention to the "business cycle" with the avowed intention or hope of destroying it. We gather, disseminate and study trade statistics of movements of commodities, price fluctuations, quantity of production and, unfortunately only to a very limited extent, of quantity of consumption.

Let us say then that we know a great deal more than we used to know. We endeavor by the use of this knowledge to forecast the future of trade, but in doing so we consciously or unconsciously employ empiric rules developed from past experiences when we did not have this newly acquired knowledge and therefore were not acting in its light. It is precisely the same as if we expected a man to be as slow or as fast in pressing the button to denote the star's transit after he was informed of the amount and sign—minus or plus—of his error as he was before, when he thought he was doing it just right.

If one business man were in sole and secret possession of all the charts and forecasts in existence his way would be easy. He could "beat the game" very readily. But others have the information also. If the whole crowd is trying to beat the game with the new-found information, the outcome or course of business will be different from what it would have been in the old days when the knowledge was not prevalent. But in all the balancing of influences that has been done by the forecasters, and in all the repeated analyses of the forces at work for and against prosperity, no attempt has been made to measure this new factor, admittedly influential—and let us say constructive—though it be.

Accidents Steadily Increasing

SOME of the unfortunate effects of the sudden curtailment of expenses which came in 1920 in many industries are now being shown in the statistics of industrial accidents in the United States. During the war period and for a short time thereafter large amounts of money were expended on personnel and safety work, but when cost reduction became necessary it was not always wisely carried out. Safety organizations suffered and precautions against accident diminished. It is now estimated by the National Safety Council from statistics collected from States, insurance agencies and industrial companies that 1923 will show an increase of 20 per cent in industrial accidents. Reports from nine States show more than 500,000 accidents, an increase of about 100,000 over the previous year. The total for last year is estimated at 3,000,000 accidents, of which 23,000 were fatal and 115,000 caused permanent disability. The total cost is estimated at $1,000,000,000.

All apart from the suffering and the loss in breaking up family relations due to this increase of accidents, the money cost is enough to cause manufacturers to rebuild the safety organizations and re-establish the old regulations which for years did so much to prevent accidents.

At the safety conference held in Harrisburg last week it was pointed out that accidents in Pennsylvania had been increasing steadily since

1921. It is to be hoped that the country will not have to pay the price of a further increase before the discredit of the situation spurs management to the regaining of the lost ground.

Excessive Taxation of Iron Ore

IN the article on the Lake Superior iron ore trade published in the Annual Review Number of THE IRON AGE, Jan. 3, attention was called to the gradual absorption of profits of the ore industry in Minnesota by the State.

The Northwest is a laboratory where, for good or ill, experiments in government are carried on. Some of these may be sound; others are not. Some will succeed; others will fail and be abandoned. Some of them are calculated, others are fortuitous excursions into the unknown. Probably on the part of most of those who have been influential in squeezing the ore industry of Minnesota there has been no purpose to ruin private owners; but this cannot be said of all. Doubtless some of the legislators have been fully aware from the beginning of the trend of their efforts, however skilfully the desire has been concealed. They must have known what they were attempting, if they accepted to any extent whatever the statements of mine operators and others, reiterated year after year and never controverted.

If one may judge of intent by words and acts, then it is unquestionable that a group in the Minnesota legislature has been anxious to try the experiment of the nationalization of the iron ore industry. This group does not seem to be increasing in strength, and the consummation it appears to wish is not probable.

The fact that the industry has continued to grow and to produce the larger part of the iron ore used in the country has no bearing on the situation. Mining companies, expecting fair and reasonable treatment, have in the past made expenditures and taken obligations which they must carry out, in justice to themselves and to others, including the State. By methods that are the admiration of the mining world, they have attempted to overcome the increasing burdens imposed on them. Economies of all sorts have been introduced, of which mechanical equipment and larger units of operation are but two, but reductions in the scales of wages have never been an aim. By these economies they have diminished the amount of manual labor required to mine a ton of ore to an extent greater, perhaps, than would have been the case if the incentive had been less pressing. The industry must be expected to increase with the demand for iron ore, until the State's maximum production shall have been reached, or until the taxes become actually too burdensome to be borne, or until competitive fields shall be developed and the radius within which Minnesota ores can be transported economically is reduced.

Ad valorem taxes paid by iron ore in Minnesota during the last four years have averaged 66 cents per ton mined in that time. To this is added approximately 15 cents for the occupational tax in each of the years 1922 and 1923, or an average total tax for the four years of 73 cents. This includes all producers and all grades of ore. It is probable that the ore shipped from Minnesota in these years has approximated the standard non-Bessemer Mesabi grade, the average theoretic worth of which for that period has been $3.94 per ton, at the mouth of the mine. A tax of 73 cents on this is nearly 20 per cent of gross theoretic worth.

If this theoretic worth were the actual price received, these figures would be bad enough. But it is well known that considerable tonnages are sold under conditions resulting in a price less than theoretic worth. Some are delivered on a cost percentage basis, others under long term contracts, others suffer penalties for excess silica, etc.

However, leaving these conditions all out of consideration, what can be expected of an industry that pays a fifth of its gross income in State and municipal taxes alone?

British Appreciation of American Research

THE high regard in which British scientists hold American research as now conducted is a matter of recent testimony. In his presidential address before the Institute of Metals, briefly reviewed in THE IRON AGE last week, Prof. Thomas Turner quotes from Sir J. J. Thomson as to the scale on which industrial research is conducted in the United States. Citing among others the extensive laboratories of the Western Electric Co. and the General Electric Co., with their large staffs, Professor Turner said:

> In many cases much of the work in hand is as purely scientific in type as that which is conducted at the Cavendish laboratory at Cambridge. . . . They [the investigators] appear to be thoroughly interested in testing theoretical views and the general tone is similar to that of an English university.

Organized and independent research here and abroad is increasingly productive and influential. "The enthusiasm of the American workers and their knowledge of the latest developments," which the English observer commends, are outstanding characteristics. Some of our laboratories have made recent contributions to the science of metals which are of striking originality and value.

The large industrial companies maintaining such organizations, while they are following the promptings of enlightened self-interest, are at the same time adding to the common knowledge and thus to the general welfare. More and more, to their credit be it said, they have been willing to make public their findings.

Engineering Meetings at Providence

Among meetings to be held in the next few weeks under the auspices of the Providence Engineering Society may be mentioned the following:

Die castings will be discussed at a meeting of the machine shop section, on the evening of April 8, by Edward Casey, Franklin Die-Casting Corporation, Syracuse, N. Y.

Quenching media is the subject of a paper to be delivered before the local branch of the American Society for Steel Treating, on the evening of April 29, by George W. Pressell, general sales manager and chief chemist of E. F. Houghton & Co., Philadelphia.

NEW BLAST FURNACE AT TROY

Site of the Burden Stack Acquired—By-Product Coke Ovens to Be Built

The Troy Coke & Iron Corporation was incorporated at Albany, N. Y., on March 28 with capital stock of $3,000,000, and will build a modern blast furnace and by-product coke ovens at Troy, N. Y., adjoining the rolling mill and rivet works of the Burden Iron Co. Four important interests are represented in the new enterprise: the Burden Iron Co., which has been engaged in the manufacture of iron products at Troy since 1813; the Oliver & Snyder Steel Co., Pittsburgh, which has coal properties in the Connellsville district; the Foundation Co., of New York, and E. Arthur Tutein, Inc., the well-known pig iron house of Boston, Philadelphia and New York. The capital stock consists of 30,000 shares of preferred stock, with par value of $100 each, and 1000 shares of common stock of no fixed par value. It is expected that in part the cost of the new construction contemplated will be financed by an issue of bonds.

The Burden Iron Co. owns a blast furnace at Troy which was built in 1905-6 but has not been operated for a number of years, with the exception of a period in 1920 when it was leased by Frank B. Baird of Buffalo and associates for the manufacture of ferromanganese. The Troy Coke & Iron Corporation will acquire the furnace property from the Burden Iron Co. and another tract of land south of the present Burden plant, this latter to be the site of the new coke ovens. There will be 44 by-product ovens, the design and construction of which are in the hands of the Foundation Co. Coal will be furnished from the Oliver & Snyder Steel Co.'s mines near Uniontown, Pa., which produce the well-known old basin coal of that district.

The blast furnace, which will be of 400 tons daily capacity, will be built on the site of the existing Burden stack. It will be a skip-filled furnace, modern in all particulars, and the outfit will include the equipment for a new ore yard, bin system, etc. The complete plant will represent an outlay of about $4,000,000. A part of the output of the furnace will be taken by the Burden Iron Co., but most of it will be marketed by E. Arthur Tutein, Inc., in New England territory. The furnace site is well located for the production and marketing of pig iron and coke, in view of the frontage on the Hudson River, the proximity of the barge canal, and existing track connections with the New York Central and Delaware & Hudson railroads. The furnace will use both New York State and foreign ores. It is expected that construction work will begin in April and early announcement will be made concerning contracts for the blast furnace work.

The following have been elected directors of the Troy Coke & Iron Corporation: James A. Burden, I. Townsend Burden and William E. Millhouse, Burden Iron Co.; Henry Oliver and John Jenkins, Oliver & Snyder Steel Co.; Franklin Remington, John W. Doty and Alexander Murray, Foundation Co., and E. Arthur Tutein, Boston. James A. Burden is chairman of the board; Henry Oliver, president; John W. Doty, first vice-president; William E. Millhouse, second vice-president and secretary-treasurer, and Leigh Willard, manager and chief engineer.

Dominion Alloy Steel Corporation's Plant Started

The first sod was turned March 26 for the erection of the first unit of the plant of the Dominion Alloy Steel Corporation, at Sarnia, Ont., by President W. B. Boyd of Toronto. Thomas Grace, who has the contract for the foundation work, has already started and contracts for structural steel and the erection of the plant will be awarded April 10, according to a statement by Mr. Boyd. While plans have been completed for an extensive layout and much larger plant in the future, the mills proposed will be constructed in units. The first, which is now under way, will have a capacity of from 40,000 to 50,000 tons per year of alloy and fine steel. The present unit will consist of open-hearth and electric furnaces for the production of bars and shapes, and will cost $1,500,000. This unit is expected to be completed and in operation within six months, when two other units of the proposed plant are to follow.

The plant is being erected on a site of 250 acres on the St. Clair River, immediately adjoining the plant of the Imperial Oil Co., just south of the city of Sarnia. The Canadian National Railways has completed surveys and plans of the company's property with a view to building a spur line to the plant, and work on these lines is only waiting the approval of plans. Arrangements have been completed for a supply of hydro-electric power from the Ontario Hydro Electric Commission, and an ample supply is assured.

The Dominion Alloy Steel Corporation has a capital stock of $15,000,000, consisting of $7,500,000 cumulative convertible preferred and $7,500,000 common stock. Officers of the corporation include: William B. Boyd, Toronto, president; R. V. LeSueur, Sarnia, vice-president; N. L. LeSueur, Sarnia, secretary; C. Harold Wills, Marysville, Mich.; J. J. Mahon, Newark, N. J.; W. H. Kenny, Sarnia, Ont. Construction work will be in charge of R. D. Nye, formerly chief engineer of the United Alloy Steel Corp., Canton, Ohio.

The Iron Age and Its Readers

THE article on "Progress in Industrial Relations," by Charles M. Mills, published in THE IRON AGE of Jan. 24, 1924, has received many hearty commendations. Joseph H. Willetts, professor of industry at Wharton School of Finance and Commercial University of Pennsylvania, wrote to THE IRON AGE for 100 copies for use in his classes in industrial relations.

A letter to Mr. Mills from the director of industrial relations of a refining company in Wyoming says: "I wish to compliment you upon the splendid ideas contained in the article and the literary skill with which these ideas were presented." Another writer says: "I admire greatly the sane and frank point of view of the article, as well as the simple and effective way you present the situation."

THE IRON AGE in its issue of March 13 published a small item stating that James B. McCauly, Orchard Grove Avenue, Lakewood, was in the market for machinery and equipment for a plant at Richmond, Ind., in which fireproof doors were to be manufactured. Ten days later Mr. McCauly stated to our correspondent who had sent in the item that it had resulted in no less than 75 letters and that through these he had purchased complete equipment for his plant. Mr. McCauly has a high regard for the service given by THE IRON AGE and has freely expressed it.

Europe Finds Improvement in Exports

British Steel Demand Poor—Clyde March Shipbuilding Best in 13 Years—German Steel Prices Higher—Czecho-Slovakia Notes Improvement, With Employment Better

(*By Cable*)

LONDON, ENGLAND, April 1.

PIG IRON is stronger, with an upward tendency. Scotland has become a substantial purchaser of Cleveland grades. Export buying also has improved. The curtailment of output resulted in a clearance of makers' stocks.

Hematite demand is broadening, chiefly on Continental account, domestic inquiry being moderate. Foreign ore is quiet. Bilbao Rubio is dull at nominally 22½s. ($4.84) c.i.f. Tees.

Finished steel demand is poor but prices are maintained. There is little substantial export buying. Armstrong, Whitworth & Co. have secured a contract for 18 miles of railroad material for New Zealand.

Clyde shipbuilding output in March makes a new high record since 1911. It totals 16 vessels of 58,218 tons gross.

Continental position is stagnant, owing to the reluctance of the works to quote in sterling. A few second-hand parcels are being offered.

Tin plate demand is affected by the vagaries in the tin market, but there are signs of improved buying if tin settles down. There is good demand for stock 28 x 20's. Makers are well sold up and output is good.

Galvanized sheets are dull. Black sheets are quiet.

Sluggish Market in England Relieved by Activity in Construction and Locomotive Building—Shipbuilding Prospects

LONDON, ENGLAND, March 19.—It cannot be said that the present position of the iron and steel industries is a very happy one. A general business sluggishness characterizes the markets all the way through from finished material to ores. Indeed, one might almost say that there is something in the nature of a "buyers' strike" prevailing, which is affecting the producing industries not only here but also on the Continent. Of course, there has been a good deal of under-quoting on the part of the Continent, but makers here at least have the satisfaction of knowing that they are losing little actual business to their competitors on the Continent of Europe.

As can be imagined, conditions on the Cleveland iron market are far from satisfactory, trade being virtually stagnant. The output is being restricted, therefore, by the damping of furnaces but, in spite of this and price concessions, only a moderate amount of business has been attracted. The prices obtainable represent a loss to smelters so that, unless things improve before long, a further curtailment in production will be inevitable. The foundry trade is quiet, however, and export business has been lifeless. It is not therefore surprising that the February production of pig iron showed a decline compared with January, the total last month being 612,700 tons, against 636,600 tons in January. [February provided 21,128 tons per day, against 20,535 in January.]

With reference to finished material, a certain number of small orders are being picked up, but the general condition of works' order books is not at all satisfactory. Quotations generally are easy, while the threatened trouble in the coal fields adds a further element of uncertainty.

Ships and Locomotives

In spite of the unsatisfactory position in regard to iron and steel, the constructional industries are receiving a certain amount of encouragement. The shipyards will benefit, at all events, from the reported orders for 16 motor vessels which, it is stated, are being placed in connection with the new Australian meat trade scheme. It is understood that the orders will be divided between William Beardmore & Co., John Brown & Co., Furness Shipbuilding Co., Palmers Shipbuilding Co., Swan, Hunter & Wigham Richardson, Ltd., and Vickers. In addition, of course, there are contracts for five new cruisers to be placed.

British and Continental prices per gross ton, except where otherwise stated, f.o.b. makers' works, with American equivalent figured at $4.30 per £1, as follows:

Durham coke, delivered	£1	10s.		$6.45
Bilbao Rubio ore†	1	4		5.16
Cleveland No. 1 foundry	4	16		20.64
Cleveland No. 3 foundry	4	12½		19.89
Cleveland No. 4 foundry	4	12		19.78
Cleveland No. 4 forge	4	11		19.57
Cleveland basic	4	15		20.43
East Coast mixed	4	19½	to £5 0s.	21.39 to $21.50
East Coast hematite	4	19	to 5 0	21.29 to 21.50
Ferromanganese	17	0		73.10
Rails, 60 lb. and up	8	15	to 9 15	37.63 to 41.93
Billets	8	0	to 8 5	34.40 to 35.48
Sheet and tin plate bars, Welsh	8	18¾		38.43
Tin plates, base box	1	4½	to 1 5	5.27 to 5.38
				C. per Lb.
Ship plates	9	10	to 10 0	1.82 to 1.92
Boiler plates	13	0	to 13 10	2.50 to 2.59
Tees	9	10	to 10 0	1.82 to 1.92
Channels	8	15	to 9 5	1.68 to 1.78
Beams	8	10	to 9 0	1.63 to 1.73
Round bars, ¾ to 3 in.	10	10	to 11 0	2.02 to 2.11
Galvanized sheets, 24 g.	17	17½	to 18 0	3.43 to 3.46
Black sheets, 24 gage	13	10	to 13 15	2.59 to 2.64
Black sheets, Japanese specifications	15	5		2.93
Steel hoops	12	10	& 12 15*	2.40 & 2.45*
Cold rolled steel strip, 20 gage	17	2½		3.29

*Export price. †Ex-ship, Tees, nominal.

Continental Prices, All F. O. B. Channel Ports

(*Nominal*)

Foundry pig iron:				
Belgium	£4	4s.	to £4 5s.	$18.06 to $18.28
France	4	4	to 4 5	18.06 to 18.28
Luxemburg	4	4	to 4 5	18.06 to 18.28
Billets (nominal):				
Belgium	6	0	to 6 5	25.80 to 26.88
France	6	0	to 6 5	25.80 to 26.88
Merchant bars:				C. per Lb.
Belgium	7	0		1.34
Luxemburg	7	0		1.34
France	7	0		1.34
Joists (beams):				
Belgium	6	10	and upward	1.25
Luxemburg	6	10	and upward	1.25
France	6	10	and upward	1.25
Angles:				
Belgium	8	0	to 8 5	1.54 to 1.58
⅛-in. plates:				
Belgium	7	15		1.49
Germany	7	15		1.49
⅞-in. plates:				
Luxemburg	7	15		1.49
Belgium	7	15		1.49

The outlook for the locomotive industry in Scotland is said to be improving, but it is interesting to note that Beyer, Peacock & Co., the Manchester locomotive builders, experienced very adverse conditions last year, the net loss necessitating the transfer of £110,000 from reserve. The competition in the locomotive trade was so sharpened by the depression that, to keep the workshops open, orders were taken at a loss. It is reported that an important group of Spanish industrialists has placed orders in this country for rolling stock and other equipment not produced in Spain, and it is remarked that the contracts will amount to "several millions of pounds sterling."

GERMAN DEMAND ABOVE SUPPLY

Iron and Steel Prices Rising—Export Trade Meets Heavy Competition

(By Radiogram)

BERLIN, GERMANY, March 31.—The market is very firm, and domestic demand exceeds the supply of materials. Already there is a shortage of semi-finished steel. The Rhenish Westphalian steel masters refuse to accept orders except on long delivery terms.

Excellent business is reported from the iron, steel and metal consuming branches at the Leipsic fair, but buyers require long term credit.

Prices are rising. Ingots are now held at 125 gold marks per metric ton ($30.24 per gross ton); steel bars are 150 marks (1.62c. per lb.); thin steel sheets are 205 marks (2.22c. per lb.). Two weeks ago steel bars were 140 marks, and thin steel sheets 200 marks. (1.51c. and 2.16c. per lb. respectively.)

Export trade is slack because German prices are above French and Belgian prices. Owing to increasing domestic demands German makers have ceased exporting below production cost.

Negotiations to resume importing Spanish ore failed because Spain refuses to withdraw special anti-dumping duties.

CZECHO-SLOVAKIA FEELS REVIVAL

Employment Increasing, with Conditions Spotty—Tariff Restrictions Reduced Substantially

BERLIN, GERMANY, March 17.—Czecho-Slovakia's steel and iron industries have begun to share in the general trade revival. The big concerns are still far from being fully occupied; but since mid-January they have increased the number of their employees and domestic sales have increased. The export branch still complains of dullness, due to the fact that the special German market created in early 1923 by the Ruhr occupation has been definitely lost. The latest reduction in Ruhr coke prices, which took place on March 1, unfavorably affected Czecho-Slovakia's ability to compete. Germans are now systematically exporting at below their home prices, though, they affirm, also at below their production costs.

The condition of the machinery branch is varied. The agricultural machinery concerns in North Moravia, which for over a year complained of bad business, are now fully occupied; other machine concerns have very little to do. The railroad car construction branch has been helped by considerable government orders. The latest order was for 6000 cars. The automobile branch is prospering. The Nesselsdorf automobile works has largely increased the number of employees, and is working two shifts daily. The fall in the French and Belgian francs presented a serious threat; but no doubt is felt that French production cost ultimately will follow up the level of the foreign exchanges.

Czecho-Slovakia's coal production in 1923 was: Black coal, 11,596,288 metric tons; brown coal (lignite), 16,229,153 tons; coke, 1,787,065 tons; briquettes, 273,497 tons. Exported were 1,715,793 tons of coal, 2,177,612 tons of lignite and 612,186 tons of coke. Of coke and coal of both kinds only about 800,000 tons were imported. The production of black and brown coal was 3.5 per cent under that of 1922, that of coke 130 per cent higher.

Official figures of iron and steel production in all of 1923 are still lacking. In the third quarter of the year pig iron output was estimated at 200,000 to 220,000 tons; in the fourth quarter, 160,000 to 180,000 tons; the whole year's production, 750,000 tons; and about 1,000,000 tons of steel and 800,000 tons of rolled goods. In the fourth quarter domestic and foreign orders received for pig iron totaled only 120,000 tons, against 180,000 tons in the third quarter, this decline representing the dwindling influence of the Ruhr occupation.

After a period of stability, prices fell at the close of last year. Bars, after long being at 155 Czech crowns per 100 kilos, ex works, fell in December to 145 crowns; thin sheets (under 1 mm.) from 220 to 210 crowns, and structural forms from 155 to 145 crowns. The latest general tendency of Czech prices is upward. The wholesale commodities index on Feb. 1 (basis 100 in 1914) was 1029 against 990 on Jan. 1. But prices of machinery have risen, if at all, very little; and manufactured goods generally rose in the last reported month only 0.7 per cent.

Czecho-Slovakia has of late pursued a policy directed toward freer trade. In the first post-war years the Republic surrounded itself with a wall of very high duties and stringent import prohibitions, with the aim of protecting home industry. The Prague Government has of late been systematically abolishing the import restrictions; and many further restrictions will cease from March 24. In December, 1923, 140 items out of 650 in the customs tariff were freed from the import prohibition.

This policy means repudiation of the recent "Agrarian Czecho-Slovakia" propaganda, which aimed at making the Republic economically self-sufficient, by discouraging the export finishing manufactures, paying for indispensable foreign goods by export of wood, coal and raw materials, and diverting the industrial population to the land. The new policy recognizes that Czecho-Slovakia is by nature an exporter of finished manufactures and that, that being so, she must give reasonable facilities for import. The high import duties have, however, been maintained.

Exports of iron and steel and wares thereof in 1923 were as follows, by quarters:

(In Metric Tons)

	Total	Thereof to Germany	In Values (Czech Crowns)
First quarter.....	102,123	44,628	143,247,000
Second quarter...	165,377	91,103	265,988,000
Third quarter....	170,588	115,788	299,733,000
Fourth quarter...	128,507	62,795	259,206,000
	566,595	314,314	968,174,000

In 1922 Czecho-Slovakia sold to Germany only 19,689 tons of pig iron, 8846 tons of semi-finished materials, and 5578 tons of sheets.

The committee on plain limit gages for general engineering work (a sectional committee under the A. E. S. C.) met at the Bureau of Standards on Feb. 14. Proof sheets of the committee's report containing fundamental definitions and a classification of fits for machined parts were revised to bring them into complete harmony with the revised report of the National Screw Thread Commission, and two additional sub-committee reports were tentatively approved. The complete report of the committee will soon be ready for transmittal to the sponsor societies for approval as an American standard.

The Swedish Geological Institute has issued a report on freshly discovered ore deposits in the Vesterbotton province of Lapland. Besides the previously known large iron-bearing areas, new ones containing almost entirely phosphorus-free iron ore have been discovered, likewise easily exploited copper and zinc orefields. A Dutch, Swedish and German group is said to be negotiating to form a company to exploit the orefields.

EXPORTS TO JAPAN INCREASE

Reconstruction Board Buys—Reimposed Duties—Fewer Sales of Continental Steel to United States

NEW YORK, April 1.—Japanese trade continues to show improvement, although purchases are still largely confined to municipalities and the larger companies. A few inquiries for black sheets are current but no sales of importance are noted. The Reconstruction Bureau of the Department of Home Affairs, which is now handling the rebuilding in the devastated area, has awarded the 800 tons of sheet piling recently inquired for to the Mitsubishi Shoji Kaisha, New York, which placed the business with the leading independent. The inquiry of the Imperial Government Railways for 500 tons of sheet piling was also placed with the Mitsubishi Shoji Kaishi, New York.

The Metropolitan Reconstruction Board no longer being in existence, purchasing is now in the hands of the Reconstruction Bureau of the Department of Home Affairs, according to Japanese officials in the United States. The free list of certain specified products, including iron and steel, established following the earthquake, expired March 31, exemption being extended for a limited period on only a few food products and some building materials. Iron and steel products now enter under the regular tariff.

The recent inquiry of the Dairen Seisakusho Kakai, Dairen, Manchuria, for 800 tons of plates, shapes and bars for car bodies was only placed in part, about 400 tons being divided between Mitsui & Co. and Suzuki & Co. The Dairen Dockyard Co., which several months ago bought about 800 tons of plates, shapes and bars from a Continental seller and later purchased about the same tonnage from stock in Japan, is expected to be in the market again for a similar tonnage for shipbuilding. A New York exporter recently booked an order for 400 tons of wire rods from a Japanese company.

A few orders for small lots of material continue from Chinese markets, but with the prospect of renewed fighting, merchants are not inclined to carry heavy stocks. There is a light demand for wire shorts, plate cuttings and old material. Chinese offering prices for second-hand plates, etc., have dropped off about $2, the usual firm offer being $26 to $27 per ton, c.i.f. China. New material purchases are, according to reports, still being made in European markets.

The tide of importation of European material into the United States is evidently receding. French mills are no longer inclined to quote except on particularly satisfactory tonnages. One importer, who has been dealing with the Longovica, an export combination of a number of French independents, has lately been refused quotations. In another case a French seller refused to quote, claiming that in a majority of transactions with consumers in the United States the business showed but little profit, although done at a higher price, because of the precise specifications demanded, backed by severe inspection. Disinclination to quote is evidently not confined to one seller in France. An importer in New York, who had an order in with a French mill for about 1700 tons of material, endeavored to increase the tonnage prior to shipment and was refused. In addition to this lack of interest in sales to the United States by the European sellers, the weaker tendency in the American domestic market is quite evidently reducing the interest of consumers in low-priced foreign products. Nevertheless, a sizable tonnage of bars, shapes and some plates is beginning to arrive at Atlantic ports, and the effect on sales of such material from warehouse stocks is awaited with interest.

New York Central Car Dumper to Be Installed at Ashtabula Harbor

An order for a car dumper to be erected at Ashtabula Harbor, Ohio, and to cost approximately $500,000, has been placed by the New York Central Railroad with the McMyler Interstate Co., Bedford, Ohio. This will be a combination steam and electric machine and will have a capacity for handling 120-ton cars. It will be largely similar to a dumper that has just been erected by the McMyler Interstate Co. for the Philadelphia & Reading Railroad at Philadelphia. It will unload 40 cars or 4800 tons of coal per hour and will load one of the largest lake furnace vessels in less than 3 hr.

Tendencies in Industrial Training

Tendencies in industrial training activities are dealt with in a recently printed 20-page report of the committee on training methods of the American Management Association, 20 Vesey Street, New York. Among the members of this committee are C. R. Sturtevant, American Steel & Wire Co., Cleveland; F. T. Jones, White Motor Co., Cleveland; C. L. Peake, American Radiator Co., Buffalo, and F. E. Searle, Ford Motor Co., Detroit.

The report is based largely on 60 replies to a comprehensive questionnaire sent to company members of the association, these companies being of two groups, manufacturing and commercial companies.

The central control of training and educational activities, the training of new employees in departments by local instructors, educational work as the function of the personnel department, and apprentice schools are some of the subjects covered. In conducting apprentice training only three of more than 70 manufacturers were found to be taking advantage of the Smith-Hughes act for obtaining instructors paid by the Government, which is taken to indicate that many manufacturers are unfamiliar with, or least not inclined to make use of, the act.

In respect to education in economics, it was revealed that 70 per cent of the manufacturers reporting give their employees information about business and economic conditions affecting the business, and in this connection the report gives information on the various methods, or mediums, such as employees' papers, meetings, bulletin boards, used for this purpose. Other topics discussed are the training of salesmen by systematic plan, basing of training methods on job specifications and the use of correspondence courses.

United States Steel Corporation Extending the Eight-Hour Turn

Elimination of the long work day in plants of the Carnegie Steel Co., effective April 1, has been extended to include plant policemen and safety department workers, who hereafter are to work on 8-hr. turns. Similar action is probable on the part of other Steel Corporation subsidiaries and the Youngstown Sheet & Tube Co. has made a start in this direction. Some of the men of that company are on 8-hr. turns and some on 10-hr. shifts, but as the force is built up, the latter turn will be eliminated.

Production of Rails in 1923

The production of rails in the United States in 1923, as shown by the special statistical board of the American Iron and Steel Institute, amounted to 2,904,516 tons, the largest tonnage since 1917, when 2,944,161 tons was rolled. Of the 1923 tonnage, 2,738,779 tons was open-hearth, 25,877 Bessemer and 139,792 tons was re-rolled from steel rails. Production of alloy treated steel rails amounted to only 2142 tons.

The new by-product coke ovens being erected by the Trumbull-Cliffs Furnace Co. at Warren, Ohio, in connection with the company's blast furnace, will be in operation by July 1.

MACHINE-TOOL EXPORT PROBLEM

Opportunities Lie in Non-European Markets—Trade in Hands of British and American Builders

That the outstanding opportunity for export of machine-tools will be for general service equipment to non-European markets and that German competition has lost its force, putting the trade in the hands of British and American manufacturers, were views expressed by W. H. Rastall, chief of industrial machinery division, Bureau of Foreign and Domestic Commerce, in an address on "The Export Problem of the Machine Tool Industry," given at the machine-tool conference held at the Engineers' Club, Philadelphia, March 25. The conference was under the auspices of the Engineers' Club of Philadelphia, and the local chapter of the American Society of Mechanical Engineers, with the cooperation of the machine-shop division of that society.

In pre-war years, it was stated, competition in the world's markets was met principally from manufacturers in Great Britain and Germany. During 1913 the United States exported more than 16 million dollars worth of metal working machinery, the United Kingdom less than 5 million dollars worth, while Germany exported nearly 19½ million dollars worth. During the war exports from the United Kingdom were said to have continued at about pre-war rate, those from the United States expanding rapidly to a total of nearly 85 million dollars in 1917. The allied blockade prevented export of machinery from Germany. From 1918 our trade decreased to about 52 million, but following the armistice it expanded again to about 59 million in 1919, since which time there has been a further decline, and the returns for 1923 show this export trade at about 12 million dollars, or slightly under the pre-war level.

Germans Try to Come Back

Following the armistice, said Mr. Rastall, German manufacturers made an effort to recover their old position, but many circumstances were said to have arisen to make this difficult. Through 1921 and 1922 it was felt that the depreciating mark gave German manufacturers a peculiar advantage in the world's markets for metal working equipment and that to a certain extent these influences continue even now. Information reaching Washington was said, however, to indicate that these reports have been greatly exaggerated, and while it is true in many instances that German machinery has been sold at prices 50 per cent less or more under the corresponding American quotations, the volume of German metal working equipment shipped into the world's markets has not been very large.

It was stated as perfectly true that the situation is one that would cause the American machine-tool exporter a great deal of annoyance and worry, and that undoubtedly in a number of markets stocks of German machinery are carried at prices represented by the depreciating mark which will interfere with certain classes of trade for some time to come. However, said Mr. Rastall, late in 1923 the utter collapse of the mark resulted in conditions that make it very difficult for German manufacturers to continue this trade.

The indications are, he said, that German costs are now above world-market levels, and until conditions change in Europe, it is to be assumed that German competition has lost its force. From this arises the situation that the machine tool trade is in the hands of British and American manufacturers, for which reason it was pointed out as necessary to give attention to the competition to be expected from British sources.

European and Non-European Demand Different

It was stated that in the cultivation of the foreign markets careful discrimination should be exercised by American interests between the European and non-European demand. Manufacturers of production tools will find almost no demand for their equipment in Asia, Latin America, Australia or Africa, their export interests lying almost exclusively in Europe. As a class, these seem to be the manufacturers who have made the best export showing. Conditions in Europe during recent years were said to have seriously interfered with this trade, however, and there is little that can be said on the subject until Europe starts to recover from the consequences of the war.

The changed trend of our machinery exports during recent years was discussed. Considering not only metal working machinery but the entire export trade in industrial machinery it was said that Europe in 1922 was absorbing only 20 per cent of exports of industrial machinery as compared to about 30 per cent in pre-war days, and Asia about 25 per cent as compared with 8 per cent in pre-war days. Latin America has also increased in importance.

Opportunities In Non-European Markets

The outstanding opportunity for export of machine tools in 1924 was thought to be that for the American manufacturer of general-service tools as in the non-European markets, this applying also to manufacturers of accessories. German competition being for the time being of little consequence, and the trade falling into the hands of British and American manufacturers, the problem before the individual American manufacturers was said to be to so cultivate these markets as to insure the sale of his equipment there. And in another part, Mr. Rastall said that the American machine tool because of its superior engineering merit must command a higher price than the usual European design, and it was up to the American manufacturers to make provision for such educational campaign as will insure intelligent buying on the part of the more or less inexperienced industrialists of these non-European countries. The American manufacturer, it was said, will have to arrange for constructive salesmanship in these markets, and these sales efforts will have to be consecutive.

In those markets formerly largely under German influence and in those markets that are showing natural expansion, were said to lie the opportunities for 1924. Among the markets formerly depending upon German sources of supply are Dutch East Indies and Chile. Markets showing natural expansion include Japan, Central Europe and British India. Recent experiences in some of these markets were said to indicate that American machinery is not as well supported as its engineering merit deserves, and it was indicated that American trade suffers because it is inadequately supported by constructive salesmanship.

Twenty Per Cent of American Product Exported

"Statistics for 1921," said Mr. Rastall, "indicate that the average American machine-tool builder exported over 20 per cent of his product, so that export business for the industry represents to a large extent, the difference between prosperity and depression. There is reason to believe that at the present time the average American manufacturer of general-service tools and machine-shop accessories should export well in excess of this ratio, and those manufacturers who are falling behind this standard will find it very much to their advantage to arrange for a careful revision of their export methods. Fortunately, it is comparatively simple to do this as experience shows that products of this character are sold in these foreign markets through machinery dealers residing in their important cities. The sales problem narrows down to that of establishing contact with some machinery dealer in each city who will be prepared to handle distribution of the product and while it is perfectly true that in many instances difficulty will be encountered in establishing such contacts, it is probably more than equally true that methods can be found that will yield results far better than have been secured heretofore. Conditions in 1924 offer a most unusual opportunity for the manufacturer of general-purpose tools in the non-European markets, and we in Washington will be glad to assist the individual American manufacturer in the solution of these problems as they develop from day to day."

MARCH IRON OUTPUT

Increase Over February Was 5624 Tons Per Day

Eleven Furnaces Blown In and Five Shut Down—Net Gain of Six

Data covering the blast furnace output of the country for March, gathered almost entirely by telegraph, show another sharp increase in the expansion which started in January. The gain last month was 5624 gross tons per day, compared with the February gain over January of 8642 tons. The January gain over December was 3159 tons per day. The increase of 386,375 tons in March over February was about 12.5 per cent.

Production of coke and anthracite pig iron for the 31 days of March amounted to 3,461,132 tons, or 111,650 tons per day, as compared with 3,074,757 tons, or 106,026 tons per day for the 29 days of February. There were 11 furnaces blown in and 5 blown out, or a net gain of 6. This compares with a net gain of 16 in February and 17 in January, indicating a possible slowing up. Of the 11 furnaces blown in 8 were steel making and 3 were merchant. Of the furnaces shut down, 4 were steel-making and one was merchant. Merchant daily production gained 2975 tons in March, while steel-making output increased 2649 tons per day.

Ferromanganese output in March was about the same as in February, 22,377 tons, compared with 22,405 tons. Spiegeleisen output advanced considerably to 13,497 tons, a gain of 3627 tons.

Daily Rate of Production

The daily rate of production of coke and anthracite pig iron by months, from March, 1923, is as follows:

Daily Rate of Pig Iron Production by Months—Gross Tons

	Steel Works	Merchant	Total
March, 1923	87,881	25,792	113,673
April	90,145	28,179	118,324
May	96,029	28,735	124,764
June	90,907	31,641	122,548
July	88,798	29,858	118,656
August	86,479	24,795	111,274
September	78,799	25,385	104,184
October	77,255	24,331	101,586
November	72,352	24,124	96,476
December	69,921	24,304	94,225
January, 1924	73,368	24,016	97,384
February	83,126	22,900	106,026
March	85,775	25,875	111,650

The figures for daily average production, beginning with January, 1918, are as follows:

Daily Average Production of Coke and Anthracite Pig Iron in the United States by Months Since Jan. 1, 1918—Gross Tons

	1918	1919	1920	1921	1922	1923	1924
Jan.	77,799	106,525	97,264	77,945	53,063	104,181	97,384
Feb.	82,835	105,006	102,720	69,187	58,214	106,935	106,026
Mar.	103,648	99,685	108,900	51,468	65,675	113,673	111,650
Apr.	109,607	82,607	91,327	39,768	69,070	118,324	.....
May	111,175	68,002	96,312	39,394	74,409	124,764	.....
June	110,793	70,495	101,451	35,494	78,701	122,280	.....
July	110,354	78,340	98,931	27,889	77,592	118,656	.....
Aug.	109,341	88,496	101,529	30,780	58,586	111,274	.....
Sept.	113,942	82,932	104,310	32,850	67,791	104,184	.....
Oct.	112,482	60,115	106,212	40,215	85,092	101,586	.....
Nov.	111,802	79,745	97,830	47,183	94,990	96,476	.....
Dec.	110,762	84,944	87,222	53,196	99,577	94,225	.....
Year	105,496	83,789	99,492	45,325	73,645	109,713	.....

Among the furnaces blown in during March were the following: Buffalo B furnace in the Buffalo district; the Lebanon Valley furnace in the Lebanon Valley; one Donora furnace of the American Steel & Wire Co., one Eliza furnace of the Jones & Laughlin Steel Corporation and No. 2 Monessen furnace of the Pittsburgh Steel Co. in the Pittsburgh district; the Claire furnace in the Shenango Valley; one Steubenville furnace of the Wheeling Steel Corporation in the Wheeling district; one Central furnace of the American Steel & Wire Co. in northern Ohio and one furnace of the Columbus works of the American Rolling Mill Co. in central Ohio and No. 3 South Chicago (old) furnace of the Illinois Steel Co. and No. 7 Gary furnace in the Chicago district.

Among the furnaces blown out or banked during March were the following: Buffalo C furnace in the Buffalo district; one Aliquippa furnace of the Jones & Laughlin Steel Corporation and No. 2 Midland furnace of the Pittsburgh Crucible Steel Co. in the Pittsburgh district; No. 2 Hubbard furnace of the Youngstown Sheet & Tube Co. in the Mahoning Valley, and No. 1 furnace of the Minnesota Steel Co. in Minnesota which went out April 1.

Output by Districts

The accompanying table gives the production of all coke and anthracite furnaces for February and the three months preceding:

Pig Iron Production by Districts, Gross Tons

	March (31 days)	Feb. (29 days)	Jan. (31 days)	Dec. (31 days)
New York	241,676	214,909	211,572	204,157
New Jersey	13,006	13,730	18,038	19,272
Lehigh Valley	97,813	87,583	91,863	83,332
Schuylkill Valley	60,208	59,020	67,757	71,838
Lower Susquehanna and Lebanon Valleys	69,719	60,478	63,789	64,002
Pittsburgh district	715,444	638,462	609,500	595,317
Shenango Valley	134,260	106,377	106,316	97,527
Western Pa.	158,218	145,984	124,503	109,419
Maryland, Virginia and Kentucky	88,635	67,733	60,235	61,470
Wheeling district	158,825	136,719	145,214	140,659
Mahoning Valley	373,493	330,420	326,629	293,043
Central and Northern Ohio	294,892	270,207	265,471	266,128
Southern Ohio	55,285	47,824	43,902	44,708
Illinois and Indiana	628,011	541,649	525,975	522,994
Mich., Minn., Mo., Wis. and Colo.	125,584	125,227	126,879	124,993
Alabama	231,763	219,358	225,556	214,013
Tennessee	14,300	9,077	5,691	8,110
Total	3,461,132	3,074,757	3,018,890	2,920,982

Production of Steel Companies—Gross Tons

Returns from all furnaces of the United States Steel Corporation and the various independent steel companies, as well as from merchant furnaces producing ferromanganese and spiegeleisen, show the foregoing totals of steel making iron, month by month, together with ferromanganese and spiegeleisen. These last, while stated separately, are also included in the columns of "total production."

Production of Steel Companies—Gross Tons

	Total Production 1923	Total Production 1924	Spiegeleisen and Ferromanganese 1923 Fe-Mn	1923 Spiegel	1924 Fe-Mn	1924 Spiegel
Jan.	2,479,727	2,274,005	19,358	12,056	20,735	7,948
Feb.	2,259,154	2,410,658	21,282	3,657	22,405	9,870
Mar.	2,724,305	2,659,044	20,730	13,832	22,377	13,497
Apr.	2,704,360	.....	20,808	7,440	.....	.....
May	2,976,892	.....	19,568	9,533	.....	.....
June	2,727,208	.....	19,717	18,289	.....	.....
½ year	15,871,646	.....	121,564	64,807	.....	.....
July	2,752,738	.....	26,493	12,876	.....	.....
Aug.	2,680,851	.....	22,045	5,586	.....	.....
Sept.	2,363,967	.....	23,206	4,478	.....	.....
Oct.	2,394,922	.....	20,015	15,931	.....	.....
Nov.	2,170,567	.....	14,839	16,783	.....	.....
Dec.	2,167,563	.....	18,069	10,124	.....	.....
Year	30,402,254	.....	246,231	130,585	.....	.....

Production and Price Chart

The fluctuations in pig iron production from 1915 to the present time are shown in the accompanying chart. The figures represented by the heavy lines are those of the daily average production, by months, of coke and anthracite iron. The dotted curve on the chart represents monthly average prices of Southern No. 2 foundry pig iron at Cincinnati, local No. 2 foundry iron at furnaces in Chicago, and No. 2X at Phila-

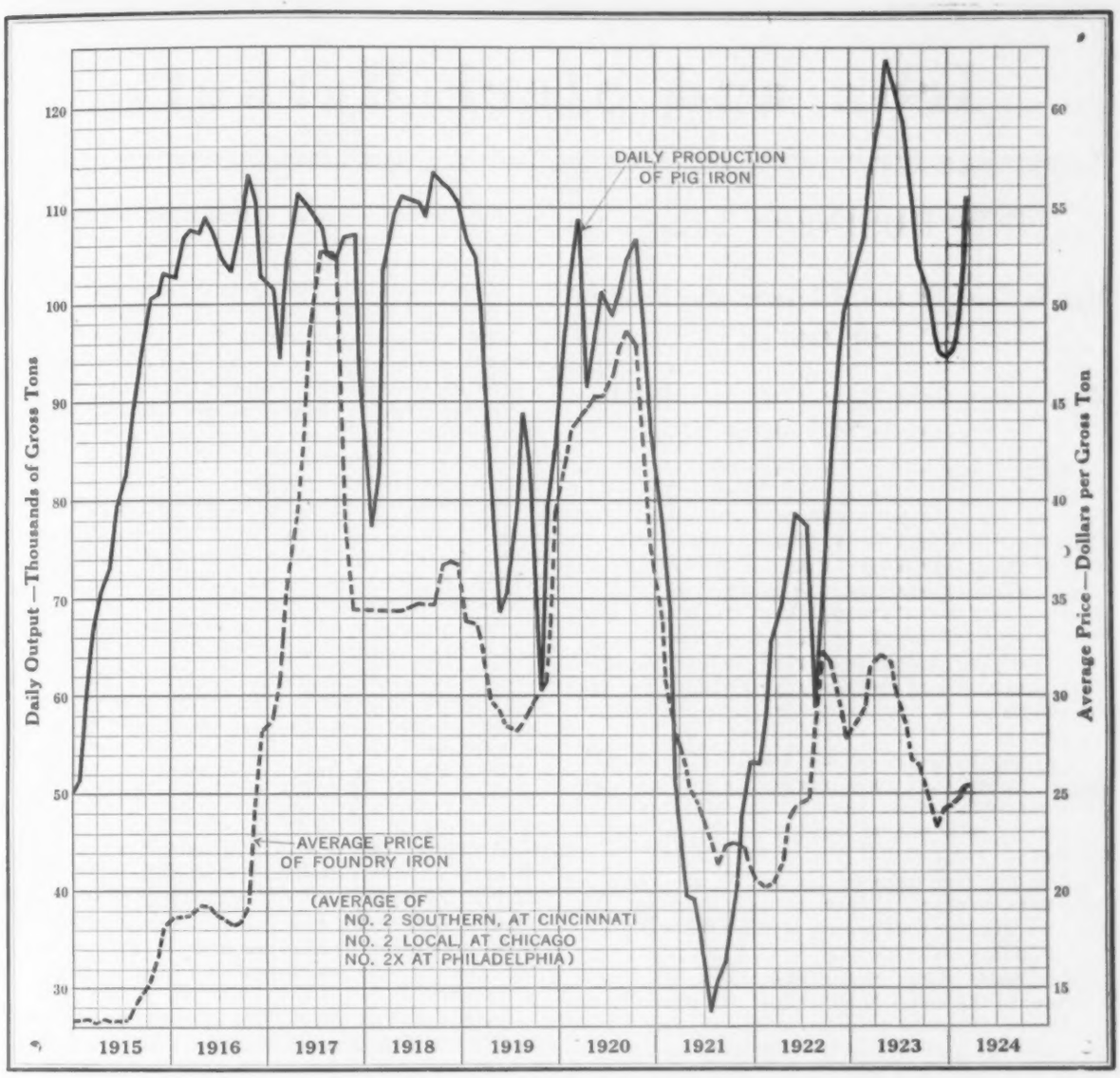


Diagram of Pig Iron Production and Price

delphia. They are based on the weekly quotations of THE IRON AGE.

Production of Coke and Anthracite Pig Iron in the United States by Months, Beginning Jan. 1, 1920—Gross Tons

	1920	1921	1922	1923	1924
Jan.	3,015,181	2,416,292	1,644,951	3,229,604	3,018,890
Feb.	2,978,879	1,937,257	1,629,991	2,994,187	3,074,757
Mar.	3,375,907	1,595,522	2,035,920	3,523,868	3,461,132
Apr.	2,739,797	1,193,041	2,072,114	3,549,736	.....
May	2,985,682	1,221,221	2,306,679	3,867,694	.....
June	3,043,540	1,064,833	2,361,028	3,676,445	.....
½ year	18,138,986	9,428,166	12,050,683	20,841,534	.....
July	3,067,043	864,555	2,405,365	3,678,334	.....
Aug.	3,147,402	954,193	1,816,170	3,449,493	.....
Sept.	3,129,323	985,529	2,033,720	3,125,512	.....
Oct.	3,292,597	1,246,676	2,637,844	3,149,158	.....
Nov.	2,934,908	1,415,481	2,849,703	2,894,295	.....
Dec.	2,703,855	1,649,086	3,086,898	2,920,982	.....
Year*	36,414,114	16,543,686	26,880,383	40,059,308	.....

*These totals do not include charcoal pig iron. The 1923 production of this iron was 251,177 tons.

Belgian iron and steel production in February, as cabled to the Department of Commerce by acting commercial attache Samuel H. Cross, Brussels, together with comparative figures for January, given in parentheses, was as follows: Pig iron, 205,930 metric tons (208,980 tons); raw steel, 219,160 tons (224,670 tons); rough castings, 6750 tons (6300 tons); finished steel, 192,820 tons (200,900 tons); finished iron, 18,440 tons (19,270 tons). There were 42 blast furnaces operating during February.

Makes 83,000,000 Coin Blanks in a Year

Eighty-three million coin blanks were stamped for the United States Government in 1923 in the plant of the Scovill Mfg. Co., Waterbury, Conn. Of these 40,000,000 were nickel blanks and 43,000,000 penny blanks. This work has been done by the Scovill company for more than a century. The coin blanks are sent to United States mints for engraving.

An electric truck joint exhibit is to be held in conjunction with the convention of the National Electric Light Association at Atlantic City May 19 to 23. The manufacturers have agreed to pool their entire interests for the common purpose of selling the electric truck idea to the central station industry instead of endeavoring to sell the individual trucks for central station use as heretofore. Twelve electric trucks, equipped with a diversity of chassis will be lined up along the full 105 ft. length.

The case of a production system for the small shop is described briefly in a leaflet issued by the policyholders' service bureau of the group insurance division of the Metropolitan Life Insurance Co., New York. It presents as adaptable a few forms obtained from J. Roy Tanner, general manager of the Pittsburgh Valve, Foundry & Construction Co. The leaflet is entitled, "Making the Most of the Small Shop."

Iron and Steel Markets

NEW BUSINESS LESS

March Steel Output Close to the Peak of Last Year

Price Concessions More Frequent—Pig Iron Production Still Increasing

March made a remarkable record in steel production and it is probable that official figures will show an ingot output equal to that of April, last year, when the peak for 1923 was reached with an annual rate of 49,000,000 tons. For two-thirds of last month new business was taken at practically the high rate of February, but in the last 10 days there was a falling off in daily bookings.

In part the change is ascribed to a pause after some measure of restocking in January and February, and in part to hesitation due to political unsettling.

The developments of the past week point to keener competition in a number of finished steel products with indications that the March rate of production will not be maintained in the second quarter.

The pig iron returns for March, as wired by producers on April 1, show an output of 3,461,132 tons, or 111,650 tons a day, against 3,074,757 tons in the 29 days of February, or 106,026 tons a day. The increase of more than 5600 tons a day largely represents the usual March effort for new records.

Eleven furnaces blew in in March and 5 blew out, the net gain being 6. February had a gain of 16 and January a gain of 17. December showed no change, after losses of 14 in November and 10 in October. The 270 furnaces in blast April 1 had an estimated capacity of 112,000 tons a day, against 108,100 tons a day for the 264 furnaces active on March 1.

Floods in the Pittsburgh and Wheeling districts caused the banking of a number of furnaces at the close of the month, but all are again in full operation.

Pittsburgh district mills are now more disposed to meet in other districts the prices which for some weeks have been named by their competitors. Freight advantage has been the decisive factor in a large amount of business, and more and more each district is having its own price, while there is no little crossing of territorial lines as competition grows keener. Variations from the 2.50c., Pittsburgh basis, so long maintained for plates and shapes, and from 2.40c. for bars now range from $2 to $4 a ton.

Recently price concessions have been more frequent because of the absence of heavy contract tonnages. Such forward business has always helped to sustain the market, since declines would have carried with them the revision of prices on orders already booked.

More effort is needed in some lines to maintain operating schedules at the recent high rate. Jobbers of merchant pipe are no longer pressing the mills for deliveries. Also some tin plate mills are unexpectedly indicating ability to take on additional second quarter business. This condition was developed by a recent Standard Oil Co. inquiry for 300,000 boxes of oil plate.

With orders for 700 freight cars and for 50 locomotives and fresh inquiries for 1000 cars and 11 locomotives, railroad buying is showing a fair amount of activity following the backlogs acquired by the equipment builders.

Railroads have figured also in the structural steel orders of the week. One third of the 28,000 tons of bookings and of the 33,000 tons of inquiries were for the carriers.

Inquiries for three Lake vessels calling for 15,000 tons of plates are still active. Bids just taken by the New York Central Railroad, on its second quarter requirements included 10,000 tons of plates, shapes and bars.

Low prices were made on the strip steel orders just placed by the Ford Motor Co., and in both the hot and cold rolled products new producers have been aggressive. The recent sheet purchases of the Ford company amounted to about 40,000 tons.

Reselling of Southern iron at $22, Birmingham, has had a depressing effect in the Cincinnati market, but in the South recent quotations are pretty well maintained. Foundry grades have declined 50 cents in the Pittsburgh and Philadelphia districts. The pig iron market enters the second quarter of the year with prices ranging from $4.50 to $9 lower than they were a year ago, and with an extremely dull market similar to that which then prevailed.

Although coal production in western Pennsylvania is at little more than 30 per cent of capacity, prices have not improved and blast furnace coke has receded to $3.75 per ton. At the same time there are renewed reports of impending wage reductions at a number of coking plants.

Another drop in THE IRON AGE pig iron composite price makes it $22.59, compared with $22.73 last week and $30.86 one year ago. It is now lower than at any time in the past ten weeks.

Recessions in steel bars, plates and beams have placed THE IRON AGE finished steel composite price at 2.703c. per lb., compared with 2.731c. last week and 2.810c. one year ago. The present figure is the lowest in more than a year, but is only 4½ per cent below the highest in that period.

Pittsburgh

Some Mills Not Well Supplied with Orders—Prices Are Softening

PITTSBURGH, April 1.—Aside from the temporary interruption occasioned by the flooded conditions of local rivers, there has been no material decline in the Pittsburgh district production of steel, but indications grow stronger that a decrease is not far off, particularly among the independent manufacturers, as new orders are not keeping pace with completed ones. The usual monthly checkup disclosed that business in nearly all of March exceeded that for the same period in February, but the industry was gaited so high that

A Comparison of Prices

Advances Over the Previous Week in Heavy Type, Declines in Italics
At date, one week, one month, and one year previous

For Early Delivery

Pig Iron, Per Gross Ton:	Apr. 1, 1924	Mar 25, 1924	Mar. 4, 1924	Apr. 3, 1923
No. 2X, Philadelphia‡	*$23.26*	$24.13	$24.26	$33.14
No. 2, Valley furnace†	*22.50*	23.00	23.00	31.00
No. 2, Southern, Cin'ti†	26.55	26.55	26.55	31.05
No. 2, Birmingham, Ala.†	22.50	22.50	22.50	27.00
No. 2 foundry, Chicago*	24.50	24.50	24.50	32.00
Basic, del'd, eastern Pa	21.50	21.50	22.75	30.25
Basic, Valley furnace	21.75	21.75	22.00	31.00
Valley Bessemer del. P'gh.	24.76	24.76	25.26	32.77
Malleable, Chicago*	24.50	24.50	24.50	32.00
Malleable, Valley	22.50	22.50	22.50	31.00
Gray forge, Pittsburgh	23.76	23.76	23.76	32.27
L. S. charcoal, Chicago	29.15	29.15	29.15	36.15
Ferromanganese, furnace	107.50	107.50	107.50	125.00
Rails, Billets, Etc., Per Gross Ton:				
O.-h. rails, heavy, at mill	$43.00	$43.00	$43.00	$43.00
Bess. billets, Pittsburgh	40.00	40.00	40.00	45.00
O.-h. billets, Pittsburgh	40.00	40.00	40.00	45.00
O.-h. sheet bars, P'gh	42.50	42.50	42.50	47.50
Forging billets, base, P'gh.	45.00	45.00	45.00	52.00
O.-h. billets, Phila	45.17	45.17	45.17	50.17
Wire rods, Pittsburgh	51.00	51.00	51.00	50.00
	Cents	Cents	Cents	Cents
Skelp, gr. steel, P'gh, lb.	2.30	2.30	2.30	2.35
Light rails at mill	2.00	2.00	2.00	2.25
Finished Iron and Steel,				
Per Lb. to Large Buyers:	Cents	Cents	Cents	Cents
Iron bars, Philadelphia	2.52	2.52	2.57	2.825
Iron bars, Chicago	2.40	2.40	2.40	2.60
Steel bars, Pittsburgh	*2.30*	2.40	2.40	2.50
Steel bars, Chicago	*2.40*	2.50	2.50	2.84
Steel bars, New York	*2.64*	2.69	2.74	2.84
Tank plates, Pittsburgh	*2.30*	2.35	2.40	2.50
Tank plates, Chicago	2.60	2.60	2.60	2.84
Tank plates, New York	*2.54*	2.59	2.64	2.84
Beams, Pittsburgh	*2.30*	2.35	2.40	2.50
Beams, Chicago	2.60	2.60	2.60	2.84
Beams, New York	*2.59*	2.69	2.69	2.84
Steel hoops, Pittsburgh	2.90	2.90	3.00	3.30

*The average switching charge for delivery to foundries in the Chicago district is 61c. per ton.
†Silicon, 1.75 to 2.25. ‡Silicon, 2.25 to 2.75.

Sheets, Nails and Wire,	Apr. 1, 1924	Mar 25, 1924	Mar. 4, 1924	Apr. 3, 1922
Per Lb. to Large Buyers:	Cents	Cents	Cents	Cents
Sheets, black, No. 28, P'gh.	3.75	3.75	3.85	4.00
Sheets, galv., No. 28, P'gh.	4.90	4.90	5.00	5.25
Sheets, blue an'l'd, 9 & 10	2.90	2.90	3.00	3.25
Wire nails, Pittsburgh	3.00	3.00	3.00	2.90
Plain wire, Pittsburgh	3.75	3.75	2.75	2.65
Barbed wire, galv., P'gh.	3.80	3.80	3.80	3.70
Tin plate, 100-lb. box, P'gh.	$5.50	$5.50	$5.50	$6.00
Old Material, Old Material, Per Gross Ton:				
Carwheels, Chicago	*$17.00*	$18.50	$20.50	$28.50
Carwheels, Philadelphia	18.50	18.50	19.00	27.00
Heavy steel scrap, P'gh	*17.50*	18.00	20.00	27.00
Heavy steel scrap, Phila.	*16.00*	16.50	17.00	24.50
Heavy steel scrap, Ch'go	*15.00*	15.50	17.50	23.00
No. 1 cast, Pittsburgh	*19.00*	20.00	20.50	28.00
No. 1 cast, Philadelphia	18.50	18.50	19.00	27.00
No. 1 cast, Ch'go (net ton)	*19.00*	19.50	20.50	26.50
No. 1 RR. wrot. Phila.	19.00	19.00	19.00	28.00
No. 1 RR. wrot. Ch'go (net)	*13.00*	13.50	14.50	20.50
Coke, Connellsville, Per Net Ton at Oven:				
Furnace coke, prompt	*$3.75*	$4.00	$4.15	$7.00
Foundry coke, prompt	4.75	4.75	5.00	8.50
Metals,				
Per Lb. to Large Buyers:	Cents	Cents	Cents	Cents
Lake copper, New York	*13.75*	13.87½	14.00	17.37½
Electrolytic copper, refinery	*13.37½*	13.50	13.75	17.12½
Zinc, St. Louis	*6.22½*	6.37½	6.75	7.65
Zinc, New York	*6.57½*	6.72½	7.10	8.00
Lead, St. Louis	*8.70*	8.85	9.50	8.20
Lead, New York	9.00	9.00	9.50	8.50
Tin (Straits), New York	*50.62½*	52.50	55.75	47.62½
Antimony (Asiatic), N. Y.	*11.75*	12.00	11.25	8.75

The prices in the above table are for domestic delivery and do not necessarily apply to export business.

Composite Price, April 1, 1924, Finished Steel, 2.703c. Per Lb.

Based on prices of steel bars, beams, tank plates, plain wire, open-hearth rails, black pipe and black sheets

These products constitute 88 per cent of the United States output of finished steel

March 25, 1924,	2.731c.
March 4, 1924,	2.760c.
April 3, 1923,	2.810c.
10-year pre-war average,	1.689c.

Composite Price, April 1, 1924, Pig Iron, $22.59 Per Gross Ton

Based on average of basic and foundry irons, the basic being Valley quotation, the foundry an average of Chicago, Philadelphia and Birmingham

March 25, 1924,	$22.73
March 4, 1924,	22.88
April 3, 1923,	30.86
10-year pre-war average,	15.72

much of the incoming business was filled promptly and very little carried over into this month.

That the independent companies are not well supplied with business in the heavy tonnage products has been brought plainly to the surface by the action of these interests in meeting the prices prevailing outside of the Pittsburgh district proper. In general, steel prices are softer than they have been, this tendency finding its explanation chiefly in the fact that with buyers purchasing so close to actual requirements there is difficulty in building up back logs or in formulating economical rolling schedules. The fear now exists that the industry is coming into another quiet stretch such as developed about the middle of last year and continued until late in December. It is doubted that the automotive industry can attain the production it mapped out for this year and there is also a feeling that railroad equipment buying already has passed its peak. Evidence is not lacking, either, that production of steel has gone ahead of consumption. Jobbers of merchant pipe no longer are pressing the mills hard for deliveries, and tin plate mills which were supposed to have been solidly obligated against production over the first half of this year now are indicating ability to take on additional second quarter business. This was brought out by a recent inquiry from one of the Standard Oil companies for about 300,000 boxes of oil plate, the inquiry calling for delivery in the third quarter. The mills not being ready to enter third quarter business, it was indicated that the order might be produced and shipped in the next three months. Evidently the heavy rate of production for the past three months has resulted in ample protection against the demands for containers that will be on in a large way soon.

The pig iron market is still dull to the point of stagnation, with prices nominal and indeterminate because

of the lack of interest on the part of consumers. Downward tendency of scrap prices continues, and much of the advance built up after the purchases of the Carnegie Steel Co. late last year has been wiped out. Although coal production in this section is hardly more than 30 per cent of capacity, there is no improvement worthy of note in prices and the coke market has receded to $3.75 for furnace grade, partly because the demand is so limited, but also because that price for coke is relatively better than can be obtained for the raw coal.

Pig Iron.—Such business as has lately been done in foundry iron in this market has disclosed that $23, valley furnace, for No. 2 is no longer minimum. Only small tonnages have been sought, and while some of them have commanded that price, more of them have been closed at $22.50. Not enough business has been done in other grades to occasion any change in prices. The market in a general way is untested and probably would yield on the appearance of a sizable inquiry. Youngstown Sheet & Tube Co. recently banked one of its Hubbard furnaces, but the starting up of No. 2 Newcastle furnace, Carnegie Steel Co., leaves the same number of furnaces in production in the Valley district as a week ago. W. P. Snyder & Co. make the average price of Bessemer iron from Valley furnace in March $23.375, against $23.50 in February and of basic $22, the same price as for February.

We quote Valley furnace, the freight rate for delivery to the Cleveland or Pittsburgh district being $1.76 per gross ton:

Basic	$21.75 to $22.00
Bessemer	23.00 to 23.50
Gray forge	22.00 to 22.50
No. 2 foundry	22.50 to 23.00
No. 3 foundry	22.00 to 22.50
Malleable	22.50
Low phosphorus, copper free	29.00

Ferroalloys.—There is no occasion to change prices, as there is very little activity, but, on the other hand, not a great deal of pressure to sell. No suggestions are heard here that less than $107.50, furnace or seaboard, can be done on ferromanganese, but the fact that consumers are very sparing buyers is convincing testimony of their belief that prices will not be higher in the near future. Prices are given on page 1049.

Iron and Steel Bars.—In this district, but not beyond it, 2.40c. base Pittsburgh still is the ruling price on steel bars. Some mills in this district, however, are going as low as 2.30c. Pittsburgh on outside business and the market now appears to be quotable at 2.30c. to 2.40c. We make no change in iron bar prices, but demand is light and it is believed that concessions will be made on attractive tonnages.

We quote soft steel bars, rolled from billets, at 2.30c. to 2.40c. base; bars for cold finishing or screw stock analysis, $3 per ton over base; reinforcing bars, rolled from billets, 2.40c. base; refined iron bars, 3.15c. to 3.25c. base, in carload lots or more, f.o.b. Pittsburgh.

Semi-Finished Steel.—Open market activities still are very restricted, since the occasion does not exist for purchases beyond deliveries on contracted tonnages. Makers of sheet bars have covered their regular customers for their regular requirements and specifications from these sources are reported to be fairly full. Strip makers, dependent on outside producers for billets and slabs, also appear to have protected themselves against their second quarter requirements, but are rather sparing in their specifications because of the lighter demand for the finished product. Positive evidence that less than $40, Pittsburgh or Youngstown, can be done on billets and slabs, or that $42.50 on sheet bars is being shaded, is lacking. Considerable caution is exhibited by consumers of rods, both as regards orders and contracts, although one maker reports the taking of a second quarter contract for 10,000 tons. Generally, there is little snap to the rod market, but makers are holding to $51 base pretty firmly, save to those users who always have preferential price treatment. There is not enough demand for skelp to determine just where prices are; this material is quoted at 2.30c., but it is believed a good-sized inquiry would bring out a lower price. Prices are given on page 1049.

Wire Products.—Real activity still is lacking and until the weather becomes more seasonable and there is some opportunity for jobbers to move goods, particularly in the country districts, now largely isolated by muddy and impassable roads, not much improvement is looked for. Bad weather also has told on building activities and the consequent demand for nails. The fact that there is not enough business to give all producers a fairly full operation deprives the market of real firmness, but this is not yet evident in actual price reductions. Rather, the tendency is to hold to quotations and equalize freights with the makers having a freight advantage to point of consumption. Nails have sold at $2.95 base Pittsburgh from a Middle Western mill into northern Ohio, but that price is not common. Coated nails still are the weak spot, with some business going as low as $2.45 base per count keg. March business with makers here was somewhat in excess of that for the month before, but there is not much satisfaction in that, since all wants were easily met and there have been no appreciable accretions to mill order books. Special discounts recently announced on fence and fence materials do not appear to be helping the sales of those lines and a tendency to question the wisdom of the movement still is noted. Prices are given on page 1048.

Steel Rails.—Demand for light rails is little, if any, better than it has been, and much of the business that is being placed is going to the steel rail mills, which, it is asserted here, are not adhering very firmly to their quotations of 1.85c. to 1.90c. Billet rails are priced at 2c. to 2.15c., but the lower figure is the prevailing one.

We quote light rails: rolled from billets, 2c. to 2.15c. base (25-lb. to 45-lb.); rolled from rail steel, 1.85c. to 1.90c. base (12-lb. to 45-lb.), f.o.b. mill; standard rails, $43 per gross ton mill, for Bessemer and open-hearth sections.

Cold-Finished Steel Bars and Shafting.—Reduced operating schedules for the next few weeks of the builders of automobiles is reflected rather sharply in demand for cold-finished steel bars. New demand is moderate and there are a number of requests for deferred shipments, one of these being for 400 tons. Automobile makers seem to believe that they will eventually need the material they now are holding up, but the confidence prevailing in the Detroit district as to the early reduction in stocks of cars is not held here, as it has not been generally regarded as possible that the ambitious plans of the motor car makers could be realized. It is figured that the reduction in production will be about 15 per cent. Bar prices are holding well here at 3c. base Pittsburgh, with freight equalized with Chicago into competitive territory; it is even asserted that hot-rolled bars must drop well below current prices before there would be reason for revision of cold-finished bars. Ground shafting holds at 3.40c. base, f.o.b. mill.

Tubular Goods.—Movement of merchant pipe out of jobbers' hands being somewhat restricted by the fact that the weather over much of the country has not lately been favorable to construction work, is reflected back to orders upon the mills, which are not so large nor so urgent as they were a short time ago. Demand for oil country pipe is holding up well. It is now understood that the McCorkle Pipe Line Co. line to run from Texas and Oklahoma to the Gulf of Mexico has been increased to 1200 miles, but latest reports to mills here are to the effect that the project has not yet been financed. Boiler tubes still are weak, with some rather steep price cuts reported in seamless tubes, due to the fact that capacity is so well in excess of current demands. Prices on tubes are well below what is indicated by the quoted discounts, of which there has been no formal revision. Discounts on pipe and tubes are given on page 1048.

Structural Material.—On tonnages for delivery within the Pittsburgh area the market does not yet appear to be below 2.40c., but local mills are not getting enough business to maintain operations in this area and are going outside for orders and meeting competition of outside mills. The week has been a quiet one for local fabricating shops, only small jobs having been taken, while new inquiries appear fewer than they were recently. Prices are given on page 1048.

Plates.—Mills in this and nearby districts still are holding to a minimum of 2.40c. base Pittsburgh for local delivery, but find it necessary to meet competitive prices to do business in other districts. It is reported that one Eastern plate maker recently offered tonnages in this district at 2.35c., Pittsburgh, but this is doubted, since such a price would have meant only slightly more than 2c. mill after the absorption of freight to Pittsburgh. The market is dull and lacks strength, since there are many more sellers than buyers. Prices are given on page 1048.

Sheets.—March was the best month in orders to the American Sheet & Tin Plate Co. of any since last October, its gain in bookings as compared with February being approximately 30 per cent. This is partly explained by rather liberal orders for the roofing material for railroad cars placed about the end of February. Independent companies also did better in March than in February on new business, the increase with these manufacturers being about 20 per cent. The industry, as a whole, therefore, averaged an increase of 22½ per cent in March sales as compared with the month before. The Steel Corporation subsidiary has accumulated a good backlog and the fact that independent mill operations are heavier this week would suggest some excess of sales over shipments. Buyers are not anticipating their requirements to any considerable extent, however, and there is some fear of loss of automobile sheet tonnage in view of the prospect of lighter production schedules for the next few weeks. Much of the business of independent companies is at prices about $2 a ton below the Steel Corporation quotations. Prices are given on page 1048.

Tin Plate.—The market gives some evidence that production has been a little too heavy for the demand, and while contracts are heavy and specifications are good, all mills are not so heavily obligated that they cannot take on some more business for second quarter delivery. The American Sheet & Tin Plate Co. is operating at a slightly lower rate this week than recently due to suspension of six mills at its Farrell works due to an accident to a mill engine. Floods forced down two of the company's tin plate mills located along the Ohio River, but these will probably be back in operation before the end of the week.

Hot-Rolled Flats.—There is a fair degree of firmness to the market on hoop and band sizes, but on what are strictly called strips competition for business is sharp and prices are easy. On the narrower material, 2.90c. base is the general minimum, but on strips 2.75c. base is the ruling price on most of the business and sales above 2.90c. are few and then of very small tonnages. Prices are given on page 1048.

Cold-Rolled Strips.—This product has settled pretty generally to 4.75c. base and there are so many producers seeking a part of the demand, somewhat reduced by the lower rate of automobile production, that a higher price no longer is obtainable.

Bolts, Nuts and Rivets.—As far as actual sales are concerned, the bolt market no longer is quotable at higher than 60 and 10 per cent off list for large machine bolts. Even that price is being shaded, and with the bar market showing a softer tendency there is some doubt that much business will be closed at today's quotation. Buyers still are cautious. Some large users of rivets have been quoted a price of $2.65 base for large rivets on second quarter contracts. That price also can be given for spot shipments. Prices and discounts are given on page 1048.

Track Supplies.—Activity still is lacking and there is some shading of prices as makers find their order books dwindling. Standard spikes cannot be sold in quantity above $3 base per 100 lb. and those makers quoting small spikes at $3.50 base are not holding very rigidly to it. Prices are given on page 1048.

Coke and Coal.—The effort to hold furnace coke at $4 per net ton at ovens for second quarter delivery has not been successful. Pig iron producers not covered for that period have shown a tendency to depend upon spot offerings and this has forced a further revision of price ideas of coke producers, especially as coal could be marketed more profitably as coke even at as low as $3.75 for the latter. Spot offerings of furnace coke exceeded the demand and prices range from $3.75 to $4, with $3.85 the common maximum. Spot foundry coke still ranges from $4.75 to $5.50. The coal market remains weak despite a reduced rate of production in this district. There is some demand for slack coal and with offerings rather light, prices have stiffened slightly. We quote steam slack at $1.25 to $1.35 and gas slack from $1.25 to $1.50 per net ton at mines, an advance of 10c. to 15c. as compared with last week's prices. Mine run steam and coking coal ranges from $1.50 to $2 and mine run gas from $2 to $2.25.

Old Material.—Downward tendency of prices still is unchecked. It is impossible to interest consumers in supplies and as there is some material for which an outlet must be found prices are almost entirely what buyers feel safe in paying. We note small sales of heavy melting grade at $18 and $17.50, a further decline of 50c. a ton from last week and putting that grade back to about the point it was when purchases by the Carnegie Steel Co. resulted in an advance that did not end until $23.50 was reached. Other steel works grades are off in proportion and the best bid on low phosphorus billet and bloom crops is $21. Blast furnace material is hardly salable at any premium over machine shop turnings.

We quote for delivery to consumers' mill in the Pittsburgh and other districts taking the Pittsburgh freight rate as follows:

	Per Gross Ton
Heavy melting steel	$17.50 to $18.00
No. 1 cast, cupola size	19.00 to 20.00
Rails for rolling, Newark and Cambridge, Ohio; Cumberland, Md.; Huntington, W. Va., and Franklin, Pa.	19.00 to 20.00
Compressed sheet steel	16.00 to 16.50
Bundled sheets, sides and ends	15.00 to 15.50
Railroad knuckles and couplers	19.50 to 20.00
Railroad coil and leaf springs	19.50 to 20.00
Low phosphorus blooms and billet ends	21.00 to 21.50
Low phosphorus plate and other material	20.00 to 20.50
Railroad malleable	17.00 to 17.50
Steel car axles	20.00 to 20.50
Cast iron wheels	18.00 to 18.50
Rolled steel wheels	20.00 to 20.50
Machine shop turnings	13.00 to 13.50
Sheet bar crops	18.00 to 19.00
Heavy steel axle turnings	17.00 to 17.50
Short shoveling turnings	13.50 to 14.00
Heavy breakable cast	17.00 to 17.50
Stove plate	14.00 to 14.50
Cast iron borings	13.50 to 14.00
No. 1 railroad wrought	13.00 to 13.50
No. 2 railroad wrought	17.50 to 18.00

Hercules Explosives Co. Will Build

BIRMINGHAM, ALA., April 1.—The Hercules Explosives Co. has acquired a tract of land, 1200 acres, 14 miles southwest of Birmingham, and will erect at once a powder mill, explosives as used in this district to be produced on a large scale while other explosives are to be turned out also. Upwards of $250,000 will be spent on the development.

The Warren Foundry Co., recently incorporated at Warren, Ohio, for $150,000, has arranged to take over the plant of the Warren Metallic Bed Co., Phoenix Road. A two-story brick building and steel cupola house will be added to the buildings now on the site. The company expects to begin operations about June 1. Frederick B. Whitlock, formerly of the Interstate Foundry Co., Cleveland, is president and treasurer of the Warren Foundry Co.

United States Government specification for lubricants and liquid fuels and methods for testing is given in technical paper 323-A, recently issued by the Department of the Interior, through the Bureau of Mines. The specifications become mandatory in Government buying on June 18, but may be put into effect if so desired at an earlier date. Copies of the paper may be obtained from the superintendent of documents, Government printing office, Washington, at a price of 15c.

The Trumbull Steel Co., Warren, Ohio, last month produced 55,060 tons of ingots. This is believed a record for a plant of this size, consisting of seven 100-ton furnaces.

Chicago

Conservative Policy of Buyers Has Effect on Steel Prices—Pig Iron Very Dull

CHICAGO, April 1.—Prices of finished steel are growing increasingly flexible as the policy of consumers becomes more conservative. Buying is being restricted more and more to nearby needs and with the automobile industry reducing its operations and cancelling or suspending orders for parts, mills are evincing increasing apprehension regarding the business outlook. Bad weather is blamed for the large accumulation of unsold motor cars and in some quarters it is confidently predicted that the industry will show a rapid recovery as soon as spring sets in in earnest, but in the meantime, at any rate, production schedules are being sharply curtailed.

Fresh orders for railroad cars are few, but mills still look forward to liberal specifications against equipment purchases made earlier in the year. Fabricating awards in this district are in fair volume, although locally tonnage is slow in being placed, despite the large amount of work pending.

The operations of the Chicago mills rolling the heavier products are still practically full; in fact, the output of the Gary works in March is expected to show an increase over the previous monthly record of 275,000 tons. How long present schedules can be maintained, however, is a question which is apparently causing some producers no little concern. Soft steel bars can now be bought at 2.40c., Chicago, or $2 below the former ruling quotation. Concessions in plates are also becoming more frequent. Unfavorable weather conditions are also given as the reason for the slow sale of wire products. Scrap has shown further weakness and foundry coke has declined, while pig iron is exceedingly quiet. The only commodity which shows sustained demand is cast iron pipe.

Pig Iron.—This market is practically devoid of activity in all departments. A Michigan melter has withdrawn an inquiry for 1000 tons of malleable and a Milwaukee user has decided to postpone action on 600 tons of foundry and 200 tons of silvery. Sales of Southern foundry aggregating 500 tons have been negotiated at $23, base Birmingham. A railroad has entered the market for 800 to 1000 tons of foundry for second quarter delivery at an Indiana shop. A local manufacturer is inquiring for 300 tons each of foundry and malleable for delivery during the current quarter at an Ohio branch. In view of the reaction in the automobile industry, sellers are encouraged by the rate at which shipments are going forward against back commitments. March shipments from Northern furnaces were the heaviest for several years.

Quotations on Northern foundry high phosphorus malleable and basic irons are f.o.b. local furnaces and do not include an average switching charge of 61c. per ton. Other prices are for iron delivered at consumers' yards or, when so indicated, f.o.b. furnace other than local.

Lake Superior charcoal, averaging sil. 1.50, delivered at Chicago	$29.15
Northern coke, No. 1, sil. 2.25 to 2.75	25.00
Northern coke, foundry, No. 2, sil. 1.75 to 2.25	24.50
Malleable, not over 2.25 sil	24.50
Basic	24.50
High phosphorus	24.50
Southern No. 2	$28.51 to 29.01
Low phos., sil. 1 to 2 per cent, copper free	33.00 to 34.00
Silvery, sil. 8 per cent	37.29
Electric ferrosilicon, 14 to 16 per cent	45.42

Plates—Car buying has dropped off sharply, but the mills still have much tonnage to supply against railroad cars recently ordered. Demand for plates for oil storage tanks is almost negligible, as little new tank construction is being undertaken. The only recent award of consequence involved ten tanks requiring 1600 tons to be built in the Powell field in Texas for the Magnolia Petroleum Co. This contract was taken by the Mount Cooper Boiler & Iron Co., Tulsa, Okla. The aggregate demand for plates from all sources is of insufficient volume to insure satisfactory mill operations and consequently prices are commencing to weaken, as evidenced by occasional concessions of $2 a ton.

The mill quotation is 2.60c., Chicago. Jobbers quote 3.30c. for plates out of stock.

Ferroalloys.—There is little activity, with prices unchanged.

We quote 80 per cent ferromanganese, $115.06, delivered; 50 per cent ferrosilicon, $75, delivered; spiegeleisen, 18 to 22 per cent, $42.56 to $48.58, delivered.

Bars—Demand for soft steel bars is limited largely to nearby needs and competition for current business is keen. In fact, 2.40c. Chicago, is no longer an infrequent quotation and even better than that has been done on attractive specifications. Weakness in the market is probably ascribed in large part to hesitancy engendered by the decline in the stock market and the Washington investigations. The reaction in the automobile industry is also a factor. Parts makers in many instances have received suspensions or cancellations and hence they are in no mood to increase their commitments in steel. Mills rolling bar iron and rail steel bars are holding their recent gains in operations, although their back logs are not heavy. In fact, hard steel bar production may be adversely affected by the failure of fence post demand to reach its usual seasonable volume. Fencing generally done by the farmers at this time has been delayed by the severe weather.

Mill prices are: Mild steel bars, 2.40c. to 2.50c., Chicago; common bar iron, 2.40c., Chicago; rail steel, 2.30c., Chicago mill.

Jobbers quote 3.20c. for steel bars out of warehouse. The warehouse quotations on cold-rolled steel bars and shafting are 4c. for rounds and 4.50c. for flats, squares and hexagons.

Jobbers quote hard and medium deformed steel bars at 2.75c. to 3c. base; hoops, 4.45c.; bands, 3.95c.

Bolts and Nuts—New business is light and in some instances cancellations or suspensions have been received from automobile and automobile parts manufacturers. Orders from the implement industry fail to develop in the volume which had been expected. Implement sales also, it is said, have been retarded by the severe weather. On the other hand, the heavy precipitation of snow and rain is not an unmixed evil because it generally insures good crops. Discounts, which are weak, are those shown on page 1048 except that in this section they are based f.o.b. Chicago.

Jobbers quote structural rivets, 3.75c.; boiler rivets, 3.95c.; machine bolts up to ⅞ x 4 in., 55 and 5 per cent off; larger sizes, 55 and 5 off; carriage bolts up to ⅞ x 6 in., 50 and 5 off; larger sizes, 50 and 5 off; hot pressed nuts, squares and hexagons, tapped, $3.50 off; blank nuts, $3.50 off; coach or lag screws, gimlet points, square heads, 60 and 5 per cent off.

Cast Iron Pipe—There continue to be liberal lettings by municipalities and some unusually heavy tonnage has been placed recently by private interests. Cleveland has awarded 1500 tons of large pipe to the United States Cast Iron Pipe & Foundry Co. The same producer has booked 350 tons for Minneapolis and a large order for special fittings for Milwaukee. The National Cast Iron Pipe Co. will supply 100 tons for Springfield, Ill, and 220 tons for Arkansas City, Kan. Munster, Ind., has awarded 300 tons to James B. Clow & Sons. Ashtabula County, Ohio, with county seat at Jefferson, takes bids April 7 on 1350 tons of 10-in. Akron, Ohio, receives tenders April 4 on 360 tons of 6- to 30-in. with fittings. Litchfield, Ill., has taken bids on 300 tons. Milwaukee is asking bids until April 7 for furnishing 3295 tons of plain straight pipe, including some double spigot lugged straight pipe; also 175 tons of special castings.

We quote per net ton, f.o.b. Chicago, as follows: Water pipe, 4-in., $60.20 to $62.20; 6-in. to 10-in., inclusive, $56.20 to $58.20; 12-in. and above, $55.70 to $56.20; class A and gas pipe, $5 extra.

Wire Products—Backward weather conditions are still blamed for the small volume of current sales. One

Western producer, however, finds encouragement in the fact that March shipments show a gain over those for February. For prices, which are unchanged, see finished iron and steel, f.o.b. Pittsburgh, page 1048.

We quote warehouse prices f.o.b. Chicago: No. 6 to No. 9 bright basic wire, $3.90 per 100 lb.; extra for black annealed wire, 15c. per 100 lb.; common wire nails, 3.65c. to 3.80c. per 100 lb.; cement coated nails, 3.10c. to 3.25c. per keg.

Sheets—The current weakness in sheets as indicated by the double level, is probably due in large part to the curtailment in automobile production. Although some mills cater to the automobile trade more than others, the aggregate effect on the sheet industry as a whole has been considerable.

Mill quotations are 3.75c. to 3.85c. for No. 28 black, 2.90c. to 3c. for No. 10 blue annealed and 4.90c. to 5c. for No. 28 galvanized, all being Pittsburgh prices, subject to a freight rate to Chicago of 34c. per 100 lb.

Jobbers quote f.o.b. Chicago: 4c. for blue annealed; 4.70c. for black and 5.60c. for galvanized.

Rails and Track Supplies—The inquiry from the Southern Pacific for 131,000 tons of rails is still pending and it is thought likely that the orders will be divided between Alabama and Colorado mills. Demand for track fastenings has been encouraged. A local mill has booked an order for 4500 tons of angle bars from one road while orders from nine other lines aggregate 2500 tons of spikes and bolts and 1500 tons of tie plates.

Standard Bessemer and open-hearth rails, $43; light rails, rolled from billets, 2.25c., f.o.b. makers' mills.

Standard railroad spikes, 3.10c. mill; track bolts with square nuts, 4.10c. mill; steel tie plates, 2.60c., f.o.b. mill; angle bars, 2.75c., f.o.b. mill.

Jobbers quote standard spikes out of warehouse at 3.75c. base, and track bolts, 4.75c. base.

Structural Material—Fabricating awards for the week including 1600 tons for oil tank construction, amount to 6900 tons. Local lettings are surprisingly few in view of the large amount of pending work. It is reported, however, that the general contract has been placed for the New Palmer House, Chicago, involving 17,000 tons, and this revives hope for the early award of the steel. Bids on the steel for the Stevens Hotel, Chicago, requiring 15,000 tons will be taken April 2. A proposed theater and office building at the corner of LaSalle and Randolph Streets, Chicago, will take 6300 tons. Plain material prices appear to be unchanged.

The mill quotation on plain material is 2.60c., Chicago. Jobbers quote 3.30c. for plain material out of warehouse.

Reinforcing Bars.—A good volume of tonnage was placed during the week and a number of large pending projects are about to be closed, among them steel for the Snelling-Mendota Bridge, Minneapolis, and for an ore dock for the Soo Line at Ashland, Wis. The price situation remains substantially unchanged, with local warehouse quotations ranging from 2.75c. to 3c. Lettings include:

Illinois State road work, 300 tons to Kalman Steel Co.

St. Margaret's Hospital, Hammond, Ind., 260 tons to Concrete Steel Co.

Chicago Tribune Tower, 200 tons to Concrete Engineering Co.

United States Veterans' Hospital, Augusta, Ga., 200 tons to Kalman Steel Co.

Building at Broadway and Market Street, Milwaukee, 150 tons to Concrete Engineering Co.

Wisconsin road work, principally bridge work, 200 tons to American System of Reinforcing.

Junior High School, Gilbert, Minn., 100 tons to American System of Reinforcing.

Pending business includes:

Snelling-Mendota Bridge, Minneapolis, 1000 tons, to be opened by commissioners of Hennepin County, April 7.

Soo Line, ore dock, Ashland, Wis., 800 tons, bids taken.

Atlantic & Pacific Co. warehouse, Chicago, 500 tons.

Coke.—Effective today, local by-product foundry coke was reduced $1 a ton to $11.50 a ton, delivered Chicago switching district.

Old Material—Consumer demand is light and such orders as are being placed are developing further concessions. In fact, most grades of scrap have declined 50c. or more a ton. Railroad offerings include the Burlington, 7200 tons, the Northwestern, 4000 tons, the Illinois Central, 1500 tons, and the New York Central and the Michigan Central, blind lists.

We quote delivery in consumers' yards, Chicago and vicinity, all freight and transfer charges paid, as follows:

Per Gross Ton

Iron rails	$19.00 to	$19.50
Cast iron car wheels	17.00 to	17.50
Relaying rails, 56 and 60 lb.	26.00 to	27.00
Relaying rails, 65 lb. and heavier	27.00 to	32.00
Forged steel car wheels	18.00 to	18.50
Railroad tires, charging box size	18.00 to	18.50
Railroad leaf springs, cut apart	18.50 to	19.00
Rails for rolling	17.50 to	18.00
Steel rails, less than 3 ft.	18.50 to	19.00
Heavy melting steel	15.00 to	15.50
Frogs, switches and guards cut apart	15.50 to	16.00
Shoveling steel	14.50 to	15.00
Drop forge flashings	12.00 to	12.50
Hydraulic compressed sheets	13.00 to	13.50
Axle turnings	14.00 to	14.50
Steel angle bars	16.50 to	17.00
Steel knuckles and couplers	18.00 to	18.50
Coil springs	19.00 to	19.50
Low phos. punchings	16.50 to	17.00
Machine shop turnings	8.50 to	9.00
Cast borings	13.00 to	13.50
Short shoveling turnings	13.00 to	13.50
Railroad malleable	20.50 to	21.00
Agricultural malleable	19.00 to	19.50

Per Net Ton

Iron angle and splice bars	18.50 to	19.00
Iron arch bars and transoms	18.00 to	18.50
Iron car axles	26.00 to	26.50
Steel car axles	18.00 to	18.50
No. 1 busheling	11.50 to	12.00
No. 2 busheling	8.50 to	9.00
Cut forge	13.25 to	13.75
Pipes and flues	9.00 to	9.50
No. 1 railroad wrought	13.00 to	13.50
No. 2 railroad wrought	13.25 to	13.75
No. 1 machinery cast	19.00 to	19.50
No. 1 railroad cast	18.00 to	18.50
No. 1 agricultural cast	18.00 to	18.50
Locomotive tires, smooth	16.00 to	16.50
Stove plate	15.50 to	16.00
Grate bars	14.50 to	15.00
Brake shoes	15.50 to	16.00

R. J. Kaylor, publicity manager of the Youngstown Sheet & Tube Co., Youngstown, left this week on a speaking tour, to deliver his illustrated lecture on iron and steel making processes in a number of Western cities. His itinerary includes Denver, April 5; Omaha, April 7; Kansas City, April 9, and St. Louis, April 11. In St. Louis he speaks under auspices of the St. Louis Railway Club, in Omaha and Kansas City before iron and steel jobbers and in Denver he addresses the Quartermasters Corps of the United States Army.

New by-product coke plant of the Trumbull-Cliffs Furnace Co., Warren, Ohio, is expected to be completed and in operation July 1 next. This plant consists of 47 Koppers Becker ovens having an annual coal carbonizing capacity of 490,000 tons, from which there will be a coke yield of 367,500 tons. This will give the company some surplus coke, figuring that it can produce about 21,000 tons of pig iron a month and that it will require one ton of coke per ton of iron. On that basis the coke requirements would be 252,000 yearly.

R. R. Fauntleroy, president Moline Malleable Iron Co., St. Charles, Ill., is to be the principal speaker at a malleable meeting of the Quad City Foundrymen's Association to be held at the Davenport, Iowa, Chamber of Commerce, April 21, at 6.30 p. m. Mr. Fauntleroy received his early education in Moline when his father was in the foundry business there. Mr. Fauntleroy is the immediate past president of the American Malleable Iron Association.

Joy Machine Co., Union Trust Building, Pittsburgh, has purchased the old plant of the Colburn Machine Tool Works, at Franklin, Pa., and after minor repairs will use it in the manufacture of mechanical coal mine loaders. The plant has been idle since the Colburn Machine Tool Works removed to Cleveland several years ago.

New York

Construction Steel Continues a Large Factor of the Market

NEW YORK, April 1.—Extreme dullness continues in the pig iron market, with the price schedule untested. A New Jersey melter who inquired for 600 tons for third quarter had no difficulty in obtaining quotations and indications are that prices for that delivery will not be higher than for second quarter. One company is in the market for 1750 tons of foundry iron for delivery at different plants, and a railroad inquiry is for several hundred tons. An air brake company which recently bought 2000 tons is understood to be in the market for 1000 tons of high silicon iron. Aside from these tonnages, inquiries are for carload lots.

We quote delivered in the New York district as follows, having added to furnace price $2.27 freight from eastern Pennsylvania, $4.91 from Buffalo and $5.44 from Virginia:

East. Pa. No. 1X fdy., sil. 2.75 to 3.25	$25.27 to $25.77
East. Pa. No. 2X fdy., sil. 2.25 to 2.75	24.77 to 25.27
East. Pa. No. 2, sil. 1.75 to 2.25	24.27 to 24.77
Buffalo, sil. 1.75 to 2.25	26.41 to 26.91
No. 2X Virginia, sil. 2.25 to 2.75	31.44
No. 2 Virginia, sil. 1.75 to 2.25	30.44

Ferroalloys.—Buying of ferromanganese is still confined to small and carload lots, the delivery of which, however, is urgent in each case. Buying on a large scale or for last half delivery has not yet appeared and consumers are only covering their immediate needs. Imports for February were only 2908 gross tons, continuing the small volume which has been coming in in the three previous months. There is very little activity in spiegeleisen, sales being confined to consumers' early requirements, which are largely of the carload or small lot order. Prices are firm in both the ferromanganese and spiegeleisen markets. No activity is noted in the manganese ore market and statistics for February show the rather surprising importation of only 4430 tons for the month. The ferrosilicon and ferrochromium markets continue featureless but firm, with specifications on contract satisfactory, but new business is very light.

Cast-Iron Pipe.—Demand continues fairly heavy and prices firm. According to some makers, bookings since the first of the year have been larger than for the same period of 1923. Downington Borough Council, Downington, Pa., will receive bids until April 14, on 633 tons of 6-in., 8-in., 10-in. and 12-in. water pipe. Alternate proposals on centrifugally cast pipe are asked. We quote per net ton, f.o.b. New York, in carload lots, as follows: 6-in. and larger, $61.60 to $63.60; 4-in. and 5-in., $66.60 to $68.60; 3-in., $76.60 to $78.60, with $5 additional for Class A and gas pipe. Although this is usually the season of greatest activity in purchases of soil pipe, the market is quiet and prices practically stationary. Some makers are reported to have made an effort to increase prices about 5 points, but without appreciable success. We quote discounts of both Southern and Northern makers, f.o.b. New York, as follows: 6-in., 29½ to 30¾ per cent off list; heavy, 39½ to 40¾ per cent off list.

Warehouse Business.—Business has quieted down considerably in the past week, and although the volume of orders is still fair, total tonnage for the month probably shows up as a rule less than in either January or February. With some of the larger business going to the mills, the warehouses which usually receive these orders are competing for the smaller lots. Despite keen competition, prices still hold fairly firm. The effect that lots of foreign structural steel may have on structural material out of stock is a source of some speculation. While it will doubtless be offered at slightly lower prices, warehouses that have not purchased Continental material feel that the difference in quality will be favorable to maintenance of the price on domestic material. Sheet prices are holding fairly firm, although one jobber is reported to be retiring from the sheet market and offering black and galvanized at slightly less than the current price. We quote prices on page 1066.

Finished Iron and Steel.—New construction work involving steel continues to come out for bids in fairly large aggregate, but there is a reduced volume in New York and vicinity and a fairly substantial amount in other sections of the East. Railroad and highway bridges make up a good part of the week's awards and inquiries. Other steel products are not active and March sales totals show a marked falling off as compared with January and February. No more railroad car work of importance has developed and this is a disappointment to the steel mills, which are depending to a large extent on railroad buying for the sustaining of plate mill operations. Plates continue the weakest of all steel products, with Eastern mills now competing for carload lots at 2.25c., Pittsburgh, tonnages of greater sizes usually commanding concessions from this level. The 2.35c. quotation of a few weeks ago has almost disappeared, 2.30c., Pittsburgh, now being quoted frequently on less than carloads. Sheets are weak in price, but not to the same extent that plates, shapes and bars are affected. Other products, such as pipe, tin plate and wire nails, remain quite firm. There is irregularity in quotations on bolts, nuts and rivets. Bar iron is obtainable from Eastern mills at 2.25c., Pittsburgh, and this price is none too strong. The New York Central opened bids today (Tuesday) on its second quarter requirements, comprising several thousand tons of plates, shapes and bars, wire products, billets, together with such other products as tubes, axles, tires, etc. The Lehigh Valley has asked steel mills to quote on its second quarter requirements.

We quote for mill shipments, New York delivery, as follows: Soft steel bars, 2.64c. to 2.74c.; plates, 2.54c. to 2.64c.; structural shapes, 2.59c. to 2.69c.; bar iron, 2.54c.

Coke.—No improvement in the market is noticeable, despite contemplated curtailment of production. Standard foundry coke is quoted at $5 to $5.50 per ton and standard furnace at $4 to $4.25 per ton. Medium sulphur is obtainable at about $3.50 per ton. By-product is quoted at $10.91, Newark and Jersey City, N. J.

Old Material.—Prices continue weak and buying is confined to filling old orders. Cancellations of contracts, shipments on which are not completed, are expected. Heavy melting steel is still being purchased at $15.50 to $16 per ton, delivered eastern Pennsylvania, shipments moving to consumers at Bethlehem, Steelton and Conshohocken, Pa. Borings and turnings are still quotable at $14 to $14.50 per ton, these prices holding fairly firm as a result of activity among brokers. Specification pipe is weak, $14 per ton being paid for delivery to Lebanon, Pa., and $14.50 per ton for delivery to a consumer at Milton, Pa. Stove plate is going forward to Harrisburg and Phoenixville at $15.50 and to a New Jersey consumer at $14.50. Cast scrap is reported very weak and demand light. The whole market is extremely quiet and the downward trend of prices on most grades is still strong.

Buying prices per gross ton New York follow:

Heavy melting steel, yard	$12.00 to $12.50
Steel rails, short lengths, or equivalent	12.75 to 13.25
Rails for rolling	17.00 to 17.50
Relaying rails, nominal	25.00 to 26.00
Steel car axles	18.00 to 19.00
Iron car axles	25.00 to 26.00
No. 1 railroad wrought	16.00 to 16.50
Forge fire	10.50 to 11.00
No. 1 yard wrought, long	15.00 to 15.50
Cast borings (clean)	10.25 to 11.25
Machine-shop turnings	10.75 to 11.25
Mixed borings and turnings	10.75 to 11.25
Iron and steel pipe (1 in. diam., not under 2 ft. long)	10.25 to 10.75
Stove plate	11.75 to 12.75
Locomotive grate bars	12.00 to 12.50
Malleable cast (railroad)	14.00 to 15.00
Cast iron car wheels	16.00 to 16.50

Prices which dealers in New York and Brooklyn are quoting to local foundries per gross ton follow:

No. 1 machinery cast	$18.00 to $18.50
No. 1 heavy cast (columns, building materials, etc.), cupola size	17.00 to 17.50
No. 1 heavy cast, not cupola size	13.00 to 13.50
No. 2 cast (radiators, cast boilers, etc.)	15.00 to 15.50

Boston

Pig Iron and Old Material Business Are in the Doldrums

BOSTON, April 1.—If anything, pig iron is less active. Sales the past week were mostly of Buffalo iron, the largest lot reported being 200 tons of No. 2X. Car lot business is the rule. Because of the general apathy on the part of foundries, not much improvement in demand is expected for a month or longer. An inquiry for 600 tons of No. 2X, third quarter, from a textile machinery maker is the only prospective business of moment. Furnaces are reluctant to quote on third quarter business. With the growing dullness the domestic iron market appears steadier. While eastern Pennsylvania and Buffalo furnaces might quote $21.50, furnace base, on large tonnages, they did not sell for less than $22 base the past week. Local brokers say several furnaces have intimated they will blow out rather than cut prices. Differentials on high silicon Buffalo iron are shaded, however. A New York house offered 5000 tons No. 2 plain and an equal amount of No. 1X low phosphorus Continental. April delivery iron to foundries and brokers here the past week without takers. Not even a bid for the iron was received. Local imports for March were 360 tons Belgian, now in storage. Another lot of 350 tons is reported due here within a few days.

We quote delivered prices on the basis of the latest reported sales as follows, having added $3.65 freight from eastern Pennsylvania, $4.91 from Buffalo, $5.92 from Virginia and $9.60 from Alabama:

East. Penn., sil. 2.25 to 2.75	$26.15 to	$27.15
East. Penn., sil. 1.75 to 2.25	25.65 to	26.65
Buffalo, sil. 2.25 to 2.75		27.41
Buffalo, sil. 1.75 to 2.25		26.91
Virginia, sil. 2.25 to 2.75	32.42 to	33.42
Virginia, sil. 1.75 to 2.25	31.92 to	32.92
Alabama, sil. 2.25 to 2.75		33.10
Alabama, sil. 1.75 to 2.25		32.60

Shapes and Plates.—The demand for plates is less active, consumers and large distributors having covered fairly freely at 2.25c. to 2.30c., Pittsburgh base. The market for shapes, on the other hand, is more active due to a sudden influx of construction projects. Competition for business among fabricators is keen, low prices being named on recent jobs, particularly bridge.

Soft steel bars, $3.51½ per 100 lb. base; flats, $4.40; plain and deformed concrete bars, $3.76½; small angles, channels and tees, $3.51½; structural steel, large angles and beams, $3.61½; tire steel, $4.80 to $5.15; open-hearth spring steel, $5 to $8; crucible spring steel, $12; steel bands, $4.31½ to $5.20; hoop steel, $5.80 to $6.30; cold rolled steel, $4.35 to $4.85; toe calk steel, $6.15; heavy plates, $3.61½; light plates, $3.86½; diamond pattern plates, stock sizes, $5.90; blue annealed sheets, $4.51½; refined iron bars, $3.51½; best refined iron bars, $4.75; Wayne, $5.50; Norway rounds, $6.60; Norway squares and flats, $7.10.

Cast Iron Pipe.—Bids close this week on 200 tons 4-in. and 3-in. pipe, 1200 tons miscellaneous larger sizes and 207 tons of special castings required by Massachusetts. Bids also close on a round tonnage of 24-in. pipe wanted by Providence, R. I. Cast iron pipe prices are, if anything, steadier, there being less inclination on the part of foundries to shade them.

Coke.—The New England Gas & Coke Co. and the Providence Gas Co. announced that April specifications against first half by-product foundry coke contracts will be billed out at $12.50 a ton delivered in New England, the same price that applied to March specifications. Shipments of such fuel in March were larger than those in February this year, but somewhat less than for March, 1923. So far this year, shipments have shown an increase each month, and April is starting well. Private advices from the Connellsville district indicate a curtailment in output there, with possibly a stiffening in values.

Old Material.—Business in old materials is in the doldrums. No new business of importance developed the past week, activity being confined to the purchase of a few car lots of turnings and borings, and to shipments on old orders to Monessen, Pa., where a long standing embargo has been lifted. The checking of shipments to the Bethlehem Steel Co. has added to the quietness. Only a few cars of heavy melting steel, at $11.50 on cars, figure in recent transactions. New England foundries continue to show little interest in this scrap market, being able to supply their machinery cast requirements from local yards. Machinery cast recently purchased from the Arsenal, Watertown, Mass., has sold as low as $19 delivered. The Boston & Albany Railroad today will award 1500 tons of rerolling rails and approximately 2,000,000 tons of miscellaneous material.

The following prices are for gross ton lots delivered consuming points:

No. 1 machinery cast	$22.00 to $22.50
No. 2 machinery cast	20.00 to 20.50
Stove plates	15.50 to 16.00
Railroad malleable	19.00 to 19.50

The following prices are offered per gross ton lots, f.o.b. Boston rate shipping points:

No. 1 heavy melting steel	$11.50 to $12.50
No. 1 railroad wrought	14.00 to 14.50
No. 1 yard wrought	13.00 to 13.50
Wrought pipe (1-in. in diam., over 2 ft. long)	10.00 to 10.50
Machine shop turnings	9.50 to 10.00
Cast iron borings, chemical	11.50 to 12.00
Cast iron borings, rolling mill	10.00 to 10.50
Blast furnace borings and turnings	9.50 to 10.00
Forged scrap and bundled skeleton	9.50 to 10.00
Shafting	16.50 to 17.00
Street car axles	16.50 to 17.00
Rails for rolling	13.00 to 13.50

Buffalo

Interest in Pig Iron Declines—Prices of Some Finished Materials Shaded

BUFFALO, April 1.—Interest in pig iron buying has fallen off during the past week, comparatively little business being taken. Inquiry totaled 5000 tons, including a 1000-ton lot that originated in the West and probably will not come here; a 600-700-ton inquiry from New Jersey and a 600-ton inquiry from eastern Pennsylvania. The 3000 tons of basic iron for a Cortland, N. Y., melter has been placed in the Buffalo district and it is reported that 1500 tons additional of 3.25 to 3.75 silicon foundry which was sought by the New York Air Brake Co. last week has been placed. One furnace interest that took a 1000-ton order during the week announces that it is pretty well sold up for the second quarter and will not be active in the market till it begins to quote for the third quarter. While its third quarter books may be opened almost any time, its price for this delivery, it is stated, would be $22 base, with $22.50 and $23 silicon differentials. The present minimum price on small lots is $22, but $21.50 or $21 has been done on practically all the sizable tonnage placed. Makers are beginning to discuss blowing out of stacks. Considerable quantity of resale iron is in the district and this may act as a softening factor. Malleable has been sold at $22 during the week and some No. 2X, 2.25 to 2.75 silicon at $22.50.

We quote f.o.b., gross ton, Buffalo, as follows:

No. 1 foundry, sil. 2.75 to 3.25	$22.50 to $23.00
No. 2 foundry, sil. 2.25 to 2.75	22.00 to 22.50
No. 2 plain, sil. 1.75 to 2.25	21.50 to 22.00
Basic	21.50 to 22.00
Malleable	21.50 to 22.00
Lake Superior charcoal	29.28

Finished Iron and Steel.—Business is rather dull with most of it on a day-by-day basis instead of on the basis of future commitment. The mills are not discouraged over the outlook, but there has been some recession from the buoyant feeling of a few weeks back. The same weakness is apparent in prices, bars having now come under the influence of the softened conditions. Desirable bar tonnage could undoubtedly be placed at 2.35c., Pittsburgh. Plates and structural shape prices vary with 2.30c. and 2.35c. most frequently mentioned. Plate business is dull with the National Car Co. about the only prospect. This Hamilton, Ont., car builder will require about 3000 tons of plates and shapes for its recently assumed operations program. Fabricated structural business is good, but without any large tonnage involved except the Liberty Bank building in Buffalo, mentioned before, on which bids for the general contract will close early this month. Bids must be in by April 8 for 400 tons of steel for a high school at Dunkirk, N. Y. Sheet mills are running mostly on automobile business and are short of specifications. Seneca Iron & Steel Co. has reduced operations from 12 to 11 mills. Second quarter sheet busi-

ness could probably be placed at lower than 3.75c. and 4.90c.

We quote warehouse prices, Buffalo, as follows: Structural shapes, 3.65c.; plates, 3.65c.; soft steel bars, 3.55c.; hoops, 4.65c.; bands, 4.35c.; blue annealed sheets, No. 10 gage, 4.30c.; galvanized steel sheets, No. 28 gage, 6.10c.; black sheets, No. 28 gage, 5c.; cold rolled round shafting, 4.45c.

Old Material.—The market has become more depressed during the past few days and prices have sagged off on almost every grade. Mills have ceased buying and dealers are waiting for the market to go lower before doing any buying to stock their yards. Heavy melting steel is now being quoted between $17.50 and $18, and one large consumer reports having been able to buy small lots at $16. A real tonnage of No. 1 heavy melting steel would probably command $17.50, but since no large tonnages have been bought recently it is difficult to gage the market exactly. Some activity has taken place in malleable and approximately 1000 tons has been placed during the wek at $19.50 to $20. A large mill which, it was expected, might enter the market about the first of the month, is preparing to reduce its operations by one open-hearth, it is said, so that this interest's buying policy for the next period, immediately in the future, is problematical.

We quote f.o.b., gross ton, Buffalo, as follows:

Heavy melting steel	$17.50 to $18.00
Low phos., 0.04 and under	20.00 to 21.00
No. 1 railroad wrought	15.00 to 16.00
Car wheels	19.00 to 19.50
Machine shop turnings	11.50 to 12.00
Cast iron borings	13.00 to 13.50
No. 1 busheling	15.50 to 16.00
Stove plate	16.50 to 17.00
Grate bars	16.00 to 16.50
Bundled sheet stampings	12.50 to 13.00
Hydraulic compressed	16.00 to 16.50
Railroad malleable	19.50 to 20.00
No. 1 machinery cast	19.00 to 19.50

Birmingham

Prices Being Maintained on Sales of Small Tonnages of Pig Iron

BIRMINGHAM, ALA., April 1.—The Southern pig iron market continues quiet. Production, however, is not diminishing. The quotations, while weaker in tone than a month previous, are being held at from $23 to $23.50 per ton, No. 2 foundry. It is denied in the Birmingham district that much iron, if any, has been sold recently at $22.50, though a Tennessee furnace interest, with differential on freight, is offering at the lower price. The sales for the past week have not been as numerous as a few weeks since and the aggregate tonnage is under the make. The surplus stock in March is estimated to have been cut down 11,000 tons, smaller companies reporting some iron going to the yards, while the larger and more active companies are taking iron from their stock. The furnace interests are basing their expectations of an early buying movement on the fact that cast iron pipe foundries, stove works and others are reporting active selling and many of these industries look forward to activity for several months.

We quote per gross ton f.o.b. Birmingham district furnace as follows:

No. 1 foundry, 2.25 to 2.75 sil.	$23.50 to $24.00
No. 2 foundry, 1.75 to 2.25 sil.	23.00
Basic	22.50 to 23.00
Charcoal, warm blast	32.00 to 33.00

Cast Iron Pipe.—The pressure pipe makers in the Birmingham district report from week to week satisfactory new business, as they are participating liberally in the business throughout the country. It is estimated that business in hand and in sight for near future will care for active operations through the first eight months of the year. Soil pipe, too, is feeling the effects of an improving condition, brought about by continued building operations throughout the country. More soil pipe shops are operating to or near capacity now in this State than for a very long time.

We quote class B, 4-in. water, $52 to $53; 6-in. and over, $48 to $49; class A, $5 higher; standard soil pipe, $60; heavy gage, $45; standard fittings, $110.

Coke.—Alabama coke producers are selling coke a little more freely though in small lots; in other words, there are more purchasers of coke. The sellers are holding the higher price which was announced three weeks ago. Production is being kept up inasmuch as the greater portion is being made and used by pig iron manufacturers. Independent coke producers are shipping practically the make, but there are a number of ovens which could be gotten into shape easily if there was need for the product. A little coke has accumulated with the furnace companies, but not to any alarming extent. Coke prices range from $5.50 to $6.50 per ton, foundry, both bee-hive and by-product coke.

Scrap.—The Southern iron and steel scrap market is holding its own in comparison to the past three weeks. There is little machinery cast and stove plate being bought, dealers not selling beyond the second quarter. Desire is intimated for spot business and negotiations can be taken up at any time for delivery of needed product. Heavy melting steel is slow and prices inclined to be weak.

We quote per gross ton f.o.b. Birmingham district yards as follows:

Cast iron borings, chemical	$15.00 to $16.00
Heavy melting steel	14.00 to 14.50
Railroad wrought	12.00 to 13.00
Steel axles	19.00 to 20.00
Iron axles	21.00 to 21.50
Steel rails	12.00 to 13.00
No. 1 cast	20.00 to 20.50
Tram car wheels	17.00 to 18.00
Car wheels	16.00 to 17.00
Stove plate	15.50 to 16.50
Machine shop turnings	7.00 to 9.00
Cast iron borings	9.00 to 10.00
Rails for rolling	16.50 to 17.00

St. Louis

Finished Material Sold on Chicago Basis—Pig Iron Very Dull

ST. LOUIS, April 1.—The market for pig iron is extremely dull. There is no buying to speak of, and inquiries are few and far between. Foundries are doing a good business, the report of the Federal Reserve Bank of St. Louis being that five reporting foundries did 63.7 per cent more business in February than in the preceding month, and 3.9 per cent over February, 1923. Sales of stove manufacturers, seven reporting, for February were 11.4 per cent larger than the month preceding, although 10.1 per cent under February, 1923. However, these and other melters are committed to their requirements into the second quarter, and they are cautious in placing any future orders. The St. Louis Coke & Iron Co. reduced its price $1 a ton to $24.50 to $25. Northern iron is quoted at $24.50, but sales have been made at $24. For Southern iron the market may be said to be from $22.50 to $23, Birmingham. The St. Louis Coke & Iron Co. sold 300 tons of foundry iron for second quarter delivery to a Missouri melter and a total of 400 tons of foundry iron in carload lots for prompt shipment to various melters in Missouri, Iowa and Illinois. A Kansas melter is in the market for 300 tons of foundry iron for second quarter delivery. A Colorado melter is in the market for a car of ferromanganese and a Missouri melter wants a car of spiegeleisen.

We quote delivered consumers' yards, St. Louis, as follows, having added to furnace prices $2.16 freight from Chicago, $3.28 from Birmingham (rail and water), $5.17 from Birmingham, all rail, and 81 cents average switching charge from Granite City:

Northern fdy., sil. 1.75 to 2.25	$26.16 to $26.66
Northern malleable, sil. 1.75 to 2.25	26.16 to 26.66
Basic	26.16 to 26.66
Southern fdy., sil. 1.75 to 2.25 (rail)	27.67
Southern foundry, sil. 1.75 to 2.25 (rail and water)	26.28
Granite City iron, sil. 1.75 to 2.25.	26.31 to 26.81

Finished Iron and Steel.—Business in finished iron and steel has become so slack in St. Louis that two of the largest concerns in the Pittsburgh district are selling material here on the basis of Chicago-plus, instead of Pittsburgh-plus. This concession of the difference in freight rates enables these concerns to compete with mills in Chicago. Of course, the making of this concession is not a general practice, but it is being done by these concerns on what they consider "desirable"

business. Some little business is being moved as a result of this concession. Neither jobbers nor manufacturers of steel products are inclined to buy, and there are no railroad inquiries pending.

For stock out of warehouse we quote: Soft steel bars, 3.35c. per lb.; iron bars, 3.35c.; structural shapes, 3.45c.; tank plates, 3.45c.; No. 10 blue annealed sheets, 4.10c.; No. 28 black sheets, cold-rolled, one pass, 4.85c.; cold drawn rounds, shafting and screw stock, 4.70c.; structural rivets, 4.15c.; boiler rivets, 4.35c.; tank rivets, ¾-in. and smaller, 50-5 per cent off list; machine bolts, 45-5 per cent; carriage bolts, 40-5 per cent; lag screws, 50-5 per cent; hot pressed nuts, squares or hexagons blank, $2.50, and tapped, $2.50 off list.

Coke.—The St. Louis Coke & Iron Co. has reduced the price of its foundry coke from $12.50 to $10 a ton, f.o.b. ovens. The present Connellsville market ranges from $4.50 to $6.50, which with $4.54 freight added, makes from $9.04 to $11, the St. Louis delivered price. Very little interest is being shown in either foundry or domestic grades.

Old Material.—The market for old material continues to weaken, and prices this week are down from 50c. to $2 a ton. Consumers in the district are said to have a good order file, but they continue to buy only as they actually need the material and in the smallest possible quantities, striving to beat down the price. There is a feeling among dealers that the bottom virtually has been reached. New railroad lists follow: Big Four, open list; Chicago & Alton, 1000 tons; Pennsylvania System, 38,000 tons; Chicago, Burlington & Quincy, 7000 tons, and Missouri Pacific 3500 tons.

Per Gross Ton

Iron rails	$15.00 to $15.50
Rails for rolling	17.50 to 18.00
Steel rails less than 3 ft.	19.00 to 19.50
Relaying rails, 60 lb. and under	25.00 to 26.00
Relaying rails, 70 lb. and over	32.50 to 33.50
Cast iron car wheels	19.00 to 19.50
Heavy melting steel	15.25 to 15.75
Heavy shoveling	15.25 to 15.75
Frogs, switches and guards cut apart	18.00 to 18.50
Railroad springs	16.25 to 16.75
Heavy axles and tire turnings	13.00 to 13.50

Per Net Ton

Steel angle bars	15.50 to 16.00
Steel car axles	19.00 to 19.50
Iron car axles	27.00 to 27.50
Wrought iron bars and transoms	19.00 to 19.50
No. 1 railroad wrought	13.50 to 14.00
No. 2 railroad wrought	14.00 to 14.50
Cast iron borings	10.50 to 11.00
No. 1 busheling	13.75 to 14.25
No. 1 railroad cast	18.50 to 19.00
No. 1 machinery cast	18.50 to 19.00
Railroad malleable	16.00 to 16.50
Machine shop turnings	9.00 to 9.50
Champion bundled sheets	9.00 to 9.50

Scrap Weak at Detroit

DETROIT, April 1.—The market on old material continues to show tendencies of weakness, with borings, turnings and hydraulic compressed registering declines of 50c. per ton. Automobile manufacturers are optimistic despite reduced production schedules and are anticipating buying activity with the advent of warmer weather. Other prices are the same as quoted a week ago.

The following prices are quoted on a gross ton basis f.o.b. cars producers' yards, excepting stove plate, No. 1 machinery cast and automobile cast, which are quoted on a net ton basis:

Heavy melting steel	$14.50 to $15.00
Shoveling steel	14.50 to 15.00
Borings	11.50 to 12.00
Short turnings	11.50 to 12.00
Long turnings	10.50 to 11.00
No. 1 machinery cast	17.00 to 17.50
Automobile cast	24.00 to 25.00
Hydraulic compressed	13.75 to 14.25
Stove plate	14.00 to 15.00
No. 1 busheling	11.50 to 12.00
Sheet clippings	10.50 to 11.00
Flashings	11.50 to 12.00

Export business of the Truscon Steel Co., Youngstown, Ohio, has shown a substantial growth the past four months, states President Julius Kahn. The company has shipped a considerable volume of its steel products to Japan, including about 300 standardized steel buildings. The company is receiving an average of 1000 orders per month in its steel sash department, from 15 to 30 standard steel buildings per day and is manufacturing from 40 to 50 miles of wire mesh daily.

Cincinnati

Pig Iron Extremely Dull—Prices of Old Material Again Decline

CINCINNATI, April 1.—The pig iron market is exceptionally dull, with prices showing a tendency to decline. There has been little opportunity to test the market, but an order for 300 tons of Southern resale iron was placed today on a $22 Birmingham basis. It is said a direct furnace quotation of $22 was also made on this business. On carload lots $22.50 is the ruling figure, though some Alabama furnaces are quoting $23. In southern Ohio $23.50 continues as the going price on the small business being booked, but on an inquiry of reasonable size it is said this price can be shaded. There were several sales of carload lots of silvery irons at the new schedule, but Bessemer and basic grades were inactive. We note a sale of 400 tons of low phosphorus at an unnamed price. The only inquiry current is for 800 tons from a Fort Wayne melter. It is expected Sarah furnace at Ironton will blow in shortly on Bessemer, and the Rockdale furnace in Tennessee will resume on ferrophosphorus this month.

Based on freight rates of $4.05 from Birmingham and $2.27 from Ironton we quote f.o.b. Cincinnati:

Southern coke, sil. 1.75 to 2.25 (base)	$26.55
Southern coke, sil. 2.25 to 2.75 (No. 2 soft)	27.05
Ohio silvery, 8 per cent	35.77
Southern Ohio coke, sil. 1.75 to 2.25 (No. 2)	25.77
Basic Northern	24.77
Malleable	25.77

Sheets.—Business is light, and prices soft. It is reported that some holdups have been received on undelivered March quotas on contracts. There has been little contracting for second quarter, buyers covering only for immediate needs. The market on sheets is not over 2.90c. for blue annealed, 3.75c. for black and 4.90c. for galvanized, with the possibility of these prices being cut to get desirable orders.

Structural Activity.—The U. S. Engineers' Office, Florence, Ala., will take bids until April 26 on 58 sluice gates, involving approximately 2000 tons of steel. The Masonic Temple at Springfield, bids closing April 24, will require 900 tons. A number of other smaller inquiries are current, on which tonnages have not been estimated. The principal award reported was for the Ford Motor Co.'s plant at Louisville, Ky., 2025 tons, to McClintic-Marshall Co. Award of the plant addition of the Lunkenheimer Co., Cincinnati, is expected to be made this week.

Reinforcing Bars.—Demand continues steady, new projects being St. Theresa's Home, Cincinnati, 450 tons, on which bids closed March 31, and a memorial stadium at University of Cincinnati, 450 tons, on which bids are in. Masonic Temple at Springfield will require approximately 300 tons. Prices are unchanged, hard steel bars being quoted at 2.10c. to 2.30c. and new billet stock at 2.30c. to 2.40c., mill.

Warehouse Business.—Local jobbers report fair activity in bars, shapes and plates, with sheets moving in better volume. Wire products are slow. Coated nails are weak, and jobbers' quotations have been reduced to $3.05 per keg.

Cincinnati jobbers quote: Iron and steel bars, 3.50c.; reinforcing bars, 3.60c.; hoops, 4.55c.; bands, 4.25c.; shapes, 3.60c.; plates, 3.60c.; cold-rolled rounds, 4.25c.; cold-rolled flats, squares and hexagons, 4.75c.; No. 10 blue annealed sheets, 4.10c.; No. 28 black sheets, 4.80c.; No. 28 galvanized sheets, 5.85c.; No. 9 annealed wire, $3.60 per 100 lb.; common wire nails, $3.50 per keg base; cement coated nails, $3.05 per keg.

Finished Materials.—There was a little more activity in the market for the heavier products during the past week, but sales are still relatively light, and are mostly for carload lots for early delivery. There is a hesitancy on the part of buyers to contract ahead, as they feel that lower prices are imminent, but another reason for this hesitancy is the fact that consumers of steel products have been unable to book work far into the future and are covering only for jobs as they come in. There was little change in the price situation during

the week. Bars apparently are being held at 2.40c., as sales were made at that figure, but on plates 2.40c. is generally recognized as the basing point for negotiations. On tonnages it is said that this price can be beaten $2 per ton, but on current business mills are loath to go below the 2.40c. figure. Quotations of 2.35c. have been reported on structural shapes, but this price applies only to large tonnages. Wire products are moving slowly, but there is no evidence of price cutting in other than coated nails. Southern Ohio mills are in position to take all the nail business, as river freights to Cincinnati are only 15c. per keg, against a 31c. rate from Pittsburgh.

Coke.—The coke market is dull and weak. Connellsville furnace and foundry grades have declined about 50c., and Wise County coke is 25c. lower. No changes are reported in New River or by-product fuels. Domestic fuels have been cut $1.50, effective April 1.

Connellsville furnace, $3.75; foundry, $4.75; New River foundry, $10.50; Wise County furnace, $4; foundry, $5; by-product foundry, $8, Connellsville basis.

Old Material.—There is practically no activity in the scrap market, although we note a sale of 1000 tons of mixed busheling. Prices continue to decline, some grades being off $1, while others are 50c. lower.

We quote dealers' buying prices, f.o.b. cars, Cincinnati:

	Per Gross Ton	
Heavy melting steel	$14.00 to	$14.50
Scrap rails for melting	13.50 to	14.00
Short rails	18.00 to	18.50
Relaying rails	28.50 to	29.00
Rails for rolling	15.50 to	16.00
Old car wheels	13.50 to	14.00
No. 1 locomotive tires	14.50 to	15.00
Railroad malleable	16.00 to	16.50
Agricultural malleable	15.00 to	15.50
Loose sheet clippings	9.00 to	9.50
Champion bundled sheets	11.00 to	11.50
Per Net Ton		
Cast iron borings	9.50 to	10.00
Machine shop turnings	8.50 to	9.00
No. 1 machinery cast	18.00 to	18.50
No. 1 railroad cast	15.00 to	15.50
Iron axles	21.50 to	22.00
No. 1 railroad wrought	11.00 to	11.50
Pipes and flues	8.00 to	8.50
No. 1 busheling	9.50 to	10.00
Mixed busheling	7.00 to	8.00
Burnt cast	10.50 to	11.00
Stove plate	10.50 to	11.00
Brake shoes	11.50 to	12.00

Cleveland

Buying of Pig Iron and Finished Materials Very Much Curtailed

CLEVELAND, April 1.—Consumers of finished materials are adhering to their policy of reducing stocks and buying only for immediate requirements. Consequently the volume of business is light and orders are for small tonnages. While the trade has given much attention to the curtailment of the automobile industry and its effect upon the steel market due to the suspension of orders for material, this slowing down is not general, as a number of leading car builders, including the Dodge, Studebaker, Cadillac and Maxwell companies, have as yet made no reduction in their production schedules. The slowing down by some of the Michigan automobile plants has resulted either in shutting off or curtailing their steel shipments and there has been some readjustment in production schedules by wheel and rim manufacturers, but in this territory the automobile parts manufacturers are keeping up their recent schedules and are not holding up steel shipments. Automobile manufacturers still expect a good spring demand for cars. Weakness has developed in steel bars, which can be bought at 2.30c. for desirable orders. Plates are obtainable at 2.30c., although 2.40c. is the common price. Structural material ranges from 2.40c. to 2.50c. In spite of the weak spots and the falling off in the demand, some producers continue to hold a firm attitude on the price situation and are booking orders at the regular quotations to which they are adhering. In structural lines a fair amount of work is coming out and the building outlook is regarded as promising. The New York Central Railroad received bids today for a round tonnage of steel for its second quarter requirements, including 10,000 tons of plates, shapes and bars. The Detroit Terminal Railway has placed 1200 tons of rails with the Bethlehem Steel Co. Inquiries for three lake boats requiring 15,000 tons of plates are still active. Hot-rolled strip steel and bands are unchanged at 2.75c. to 2.90c., and hoops are holding to the latter price. Wide strip steel is weak and is reported to have sold at 2.75c., with extras waived. Cold-rolled strip steel is irregular, with concessions from the 4.75c. price.

Jobbers quote steel bars, 3.36c.; plates and structural shapes, 3.46c.; No. 28 black sheets, 4.40c. to 4.65c.; No. 28 galvanized sheets, 5.60c. to 5.75c.; No. 10 blue annealed sheets, 3.60c. to 4c.; cold rolled rounds, 3.90c.; flats, squares and hexagons, 4.40c.; hoops and bands, 1 in. and wider and 20 gage or heavier, 4.16c.; narrower than 1 in. or lighter than No. 20 gage, 4.66c.; No. 9 annealed wire, $3.50 per 100 lb.; No. 9 galvanized wire, $3.95 per 100 lb.; common wire nails, $3.60 base per 100 lb.

Pig Iron.—Another week has passed with virtually no activity in the pig iron market. With some producers, March, from the standpoint of sales, was the dullest month since 1922, except last June. Sales during the week were limited to very few small lots for early requirements and little inquiry is pending. Contrasting with the limited buying, shipments have continued heavy. There has been a little slowing down in the demand for shipments on contracts owing to the curtailment in the automobile industry and this decrease in the demand is expected to become more noticeable. However, with most foundries in this territory the melt has so far shown no falling off. Prices are unchanged in the absence of inquiries of sufficient size to test the market, which lacks firmness. In the Valley district quotations on foundry iron range from $22 to $23 and Cleveland furnaces are still holding to $23 for outside shipment, but will meet the price situation that develops when buying becomes active. For Cleveland delivery local furnaces are still holding to $24. On Southern iron $23 is still the common quotation in this market, although as high as $23.50 is being asked.

Quotations below, except on basic and low phosphorus iron, are delivered Cleveland, and for local iron include a 50c. switching charge. Ohio silvery and Southern iron prices are based on a $3.02 freight rate from Jackson and $6 rate from Birmingham:

Basic, Valley furnace	$22.00
Northern No. 2 fdy., sil. 1.75 to 2.25	24.50
Southern fdy., sil. 1.75 to 2.25	29.00
Malleable	24.50
Ohio silvery, 8 per cent	35.52
Standard low phos., Valley furnace	29.00

Iron Ore.—Ore prices for 1924 have not yet been adopted, although a week ago it was expected that prices would be established last week. It seems probable that the market will be established by a sale to the Ford Motor Co., which recently sent out an inquiry for 250,000 tons. The Ford company asked buyers to submit quotations that would remain open 30 days. This time has already expired with some of the quotations, but probably no quotations will be withdrawn because of the expiration of the time limit. Nothing developed during the week to shed any further light on the probable prices, and it is still expected that prices will be at least 50c. a ton lower than last year.

Semi-Finished Steel.—Consumers are specifying rather cautiously for sheet bars and slabs owing to the falling off of the demand for their products. There is a total absence of new inquiry and consequently prices have not been tested recently. Quotations are unchanged on sheet bars, but slabs lack firmness.

Sheets.—Without backlog some of the independent mills are getting more in need of orders and price concessions are more common. On black sheets 3.75c. is now generally quoted by independent mills and in some cases shipments on contracts placed at the regular price are being made at this concession. Blue annealed

and galvanized sheets are firmer than black, but these are being shaded to 2.90c. and 4.90c. respectively. The recent sheet purchases by the Ford Motor Co. for the second quarter are understood to have aggregated 40,000 tons. A Cleveland stove manufacturer has divided 1000 tons of various grades between several mills. Tin mill black plate has been shaded $2 a ton to 3.75c.

Reinforcing Bars.—Inquiries have come out for a city hall in Akron and a New York Central depot in Elyria that will require round lots of reinforcing bars. An inquiry is out for 125 tons for the Euclid Oliver Hotel, Cleveland. Rail steel bars are firm at 2.10c. Quotations on billet steel bars range from 2.30c. to 2.40c.

Bolts, Nuts and Rivets.—The opening of the books for bolt and nut contracts for the second quarter has not brought out much business, as railroads and some other consumers have not yet come into the market. The demand has quieted down somewhat. The common discount on large machine bolts is 60 and 10 per cent, although some small lot business is still being taken at 60 and 5 per cent. Concessions have appeared on cold punched nuts. Rivet manufacturers are closing considerable business in second quarter contracts at the 2.75c. price, but current orders are light. As the market lacks firmness, a good inquiry for early delivery would probably bring out a lower quotation.

Coke.—The demand for foundry coke continues very light and prices are not firm. Quotations on Connellsville foundry coke for prompt shipment range from $4.75 to $6.50. Foundries are buying only for immediate requirements.

Old Material.—With no consumer demand to support the market, prices continue to slide. Turnings declined $1.25 per ton during the week, compressed sheet steel $1.75 and most other grades 50c. or more. Mixed borings and turnings have held up better than machine shop turnings because there is still some demand for the former to fill old orders. Detroit automobile companies disposed of considerable scrap during the week, this covering their April production. Most of this material went to dealers. Dodge Brothers sold approximately 5000 tons, all to dealers at $11 for shovel turnings and for borings, $15.75 for heavy melting steel, $13.35 for compressed sheet steel and $11.60 for flashings. These prices are regarded high today. A Detroit dealer is offering flashings at $11.25. Local mills are buying no material and one Valley mill has held up shipments on heavy melting steel. This grade is now quoted at $17 to $17.25 in the Valley district.

We quote dealers' prices f.o.b. Cleveland per gross ton:

Heavy melting steel	$15.75 to $16.00
Rails for rolling	16.50 to 16.75
Rails under 3 ft	16.75 to 17.00
Low phosphorus melting	18.00 to 18.25
Cast iron borings	12.50 to 13.00
Machine shop turnings	11.75 to 12.00
Mixed borings and short turnings	12.75 to 13.00
Compressed sheet steel	13.50 to 13.75
Railroad wrought	12.50 to 12.75
Railroad malleable	18.00 to 18.50
Light bundled sheet stampings	11.00 to 11.25
Steel axle turnings	14.00 to 14.25
No. 1 cast	20.00 to 20.50
No. 1 busheling	10.75 to 11.00
Drop forge flashings	10.00 to 10.50
Railroad grate bars	15.00 to 15.25
Stove plate	15.00 to 15.25
Pipes and flues	9.00 to 9.50

Car Building in the South

BIRMINGHAM, ALA., April 1.—The Fairfield Works of the Tennessee Coal, Iron & Railroad Co. has started work on the 1500 all-steel, low-side flat bottom gondola cars which were ordered by the Southern Railway. The cars are being built according to a design to meet demand for service for the handling of iron and steel products of the Birmingham district, not being built for coal hauling. The Fairfield Works will make delivery on some of the order for 1800 various kinds of freight cars ordered by the Louisville & Nashville Railroad Co. a few weeks ago, during the middle summer. Orders are in hand for more than 6000 cars at the Fairfield Works, it is understood here.

Philadelphia

Business in All Lines Shows Tapering Off and Some Prices Are Weaker

PHILADELPHIA, April 1.—April starts with considerably less optimism in iron and steel circles than was prevalent a month ago. March tonnage in nearly all lines showed a falling off from that of February. One large company estimates that its tonnage in this district last month was 50 per cent of its January sales and 75 per cent of its February record, but some of the Eastern mills did slightly better than this.

Buyers of steel products are now definitely on record as expecting lower prices. The opening of bids tomorrow (Wednesday) by the Chesapeake & Ohio Railroad on 23,000 tons of plates, 13,000 tons of shapes and 1500 tons of bars for car building is expected to make known prices on these products lower than any which have so far become general.

The most important steel buying of the past week was by the Pennsylvania Railroad, which placed fairly large orders with several mills for track materials. It ordered fully 250,000 tie plates (1500 tons), several hundred tons of spikes and a quantity of track bolts. Pig iron and scrap buying is negligible.

Pig Iron.—While buying of pig iron is not in sufficient volume to test prices fully, it is now certain that foundry iron can be bought at $22, furnace, for No. 2 plain and at $22.50 for No. 2X, but these prices will apply only to larger lots. Current business is made up chiefly of carload lots, which are being sold at 50c. or $1 a ton above these prices. The Eastern Steel Co. has had its second furnace in blast for more than a week and is again an active seller, as is the Alan Wood Iron & Steel Co., which for some weeks has not been actively seeking business. The Temple furnace is expected to go out of blast shortly. An Eastern steel company has been attempting to buy about 2000 tons of basic iron at less than the price it paid a few weeks ago, namely $21.50, delivered. No other basic buying is in prospect, most of the Eastern users being well supplied for the present. Imports of pig iron last week totaled 1018 tons, all from France.

The following quotations are, with the exception of those on low phosphorus iron, for delivery at Philadelphia and include freight rates varying from 76 cents to $1.63 per gross ton:

East. Pa. No. 2 plain, 1.75 to 2.25 sil.	$22.76 to $23.63
East. Pa. No. 2X, 2.25 to 2.75 sil.	23.26 to 24.13
East. Pa. No. 1X	23.76 to 24.63
Virginia No. 2 plain, 1.75 to 2.25 sil.	30.17 to 31.17
Virginia No. 2X, 2.25 to 2.75 sil.	30.67 to 31.67
Basic delivery eastern Pa.	21.50 to 22.50
Gray forge	22.00 to 23.00
Malleable	23.75 to 24.25
Standard low phos. (f.o.b. furnace)	27.00 to 27.50
Copper bearing low phos. (f.o.b. furnace)	27.00 to 28.00

Ferroalloys.—There is little demand for ferromanganese, and price shading is reported, but this is not confirmed by sellers. Quotations remain, nominally, at least, at $107.50, furnace or seaboard, for both domestic and imported alloy. Sales of about 1500 tons of imported spiegeleisen were made at $35, f.o.b. cars, Philadelphia, but the price is now advanced to $36. Domestic producers quote about $38, furnace.

Billets.—No real test of the billet market has been made recently. Forging billets have sold at $42, Pittsburgh, though most mills quote $45. Rerolling billets are usually quoted at $40, Pittsburgh. On large lots it is probable that concessions would be given. About 1000 tons of blooms from France were received here last week.

Plates.—Buying of plates is spotty and in general shows no improvement. Prices are very irregular, varying from 2.20c. to 2.30c., Pittsburgh. The highest price obtainable on carload lots is 2.25c., Pittsburgh, while on larger lots 2.20c. is being done. Only less than carload lots command as high as 2.30c. It is reported that quotations of 2.15c., Pittsburgh, have been sub-

mitted on the 23,000 tons of plates on which the Chesapeake & Ohio Railroad will open bids tomorrow (Wednesday). Plate mill operations scarcely average more than 40 to 50 per cent.

Bars.—Orders for bars are almost all for small lots, both consumers and jobbers adhering to a policy of very careful buying. Bar mills have resisted pressure for price concessions fairly well, but in the past few weeks there has been a gradual slipping. Prices now range from 2.30c. to 2.40c., Pittsburgh, with 2.35c. prevailing even on some minor transactions. Bar iron is unchanged but weak at 2.20c., Pittsburgh.

Sheets and Tin Plate.—Two or three mills which have been active in offering sheets at concessions of about $2 a ton have forced other mills to meet this price on many occasions, so that the sheet market does not present as strong a front as it did a few weeks ago. Tin plate, on the other hand, is firm at $5.50 and there is talk of an advance, probably to $5.75, for third quarter contracts.

Warehouse Business.—Jobbing business has fallen off considerably, due partly to the keen competition of some mills for small orders ordinarily handled by warehouses. Prices for local delivery are as follows:

Soft steel bars and small shapes, 3.47c.; iron bars (except bands), 3.47c.; round edge iron, 3.75c.; round edge steel, iron finished, 1½ x ½ in., 3.50c.; round edge steel planished, 4.30c.; tank steel plates, ¼ in. and heavier, 3.75c.; tank steel plates, ⅜ in., 3.82c.; blue annealed steel sheets, No. 10 gage, 4.10c.; black sheets, No. 28 gage, 5.15c.; galvanized sheets, No. 28 gage, 6.25c.; square twisted and deformed steel bars, 3.57c.; structural shapes, 3.57c.; diamond pattern plates, ¼-in., 5.40c.; ⅜-in., 5.60c.; spring steel, 5c.; round cold-rolled steel, 4.35c.; squares and hexagons, cold-rolled steel, 4.85c.; steel hoops, 1 in. and wider, No. 20 gage and heavier, 4.27c.; narrower than 1 in., all gages, 4.77c.; steel bands, No. 12 gage to ⅜-in., inclusive, 4.27c.; rails, 3.47c.; tool steel, 8.50c.; Norway iron, 7c.

Ore.—Receipts of iron ore from abroad last week were 9604 tons from Sweden and 4750 tons from Spain. West Africa shipped in 7982 tons of manganese ore.

Old Material.—Demand for scrap is at a minimum and prices are declining. Nearly all grades are at least 50c. a ton below the prices quoted a week ago. The falling off in the volume of finished steel orders does not encourage the scrap trade to believe in any early recovery of prices; in fact, still lower quotations are predicted. In view of the low prices now prevailing on steel scrap, it is rather surprising that 3620 tons of this grade came in last week from England.

We quote for delivery at consuming points in this district as follows:

No. 1 heavy melting steel	$16.00 to $16.50
Scrap rails	16.00 to 16.50
Steel rails for rolling	19.00 to 20.00
No. 1 low phos., heavy 0.04 and under	21.00 to 22.00
Couplers and knuckles	20.50 to 21.50
Cast-iron car wheels	18.50 to 19.00
Rolled steel wheels	20.50 to 21.50
No. 1 railroad wrought	19.00 to 19.50
No. 1 yard wrought	17.00 to 17.50
No. 1 forge fire	14.00 to 14.50
Bundled sheets (for steel works)	14.00
Mixed borings and turnings (for blast furnace use)	14.00
Machine shop turnings (for steel works use)	14.00
Machine shop turnings (for rolling mill use)	14.00 to 14.50
Heavy axle turnings (or equivalent)	15.00 to 15.50
Cast borings (for steel works and rolling mills)	14.50 to 15.00
Cast borings (for chemical plants)	17.00 to 18.00
No. 1 cast	18.50 to 19.00
Heavy breakable cast (for steel plants)	16.50
Railroad grate bars	15.50
Stove plate (for steel plant use)	15.50
Railroad malleable	17.50 to 18.00
Wrought iron and soft steel pipes and tubes (new specifications)	14.50 to 15.00
Shafting	21.00 to 22.00
Steel axles	20.00 to 21.00

Structural Material.—The Phoenix Bridge Co. has received the contract for a bridge over the St. Johns River at Jacksonville, Fla., for the Florida East Coast Railroad, requiring 4800 tons of steel. This is the largest order received by local or nearby independent fabricating shops in some time. Prices on plain material, like those on plates, vary according to the size of the tonnage. The market range is 2.25c. to 2.35c., Pittsburgh, the lower price applying usually to the most attractive tonnages. No important tonnages of imported shapes are reaching this port. Last week's imports were only 30 tons of beams, from Belgium.

Iron and Steel Jobbers' Sales in February

Taking the January, 1921, sales as 100, the statistics collected by the American Iron, Steel and Heavy Hardware Association indicate that the volume of sales in February, 1924, is represented by 133. The figure for January was 136. For January and February of 1923 sales were respectively 137 and 128 per cent of the total for January, 1921. For the same months in 1922 the figures were 84 and 79.

Accounts outstanding Feb. 29, 1924, averaged 2.2 times the total sales for the month. For December the figure was 2.2, for November 2.1 and for October 2. In May of last year, when sales were at the peak, the outstandings were only 1.7 times sales.

Prices Quoted on New York Central Material

CINCINNATI, April 1.—On Big Four plates, the Youngstown Sheet & Tube Co. quoted 2.34½c. delivered Cleveland. Republic and Carnegie companies quoted 2.40c. Pittsburgh on bars, shapes and plates. Otis and Jones & Laughlin companies quoted 2.35c. Pittsburgh on bars, shapes and plates, Lukens 2.40c. on plates and Bethlehem 2.40c. for bars and 2.50c. for plates and shapes. Chicago mills quoted 2.50c. Chicago on bars and 2.60c. on shapes and plates. The regular price was quoted on nails and 3.75c. Cleveland quoted on barbed wire.

D. M. Strickland, manager development department, American Rolling Mill Co., Middletown, Ohio, addressed a joint dinner-meeting of the Tri-City Chapter of American Society for Steel Treating and the Tri-City Section of the American Society of Mechanical Engineers at the LeClaire Hotel, Moline, Ill., March 20. His subject was the "Corrosion of Iron and Steel and Protective Coatings." His remarks were directed particularly to an explanation of the electrolytic theory of the cause of corrosion. He suggested that the action of corrosion on iron and steel is practically the same as the action which goes on in a battery where there is a passage of current between two dissimilar metals in a solution which is capable of acting as a conductor.

The Pacific Malleable Casting Co. has purchased 15 acres at Eighty-fifth Avenue and Southern Pacific tracks, Oakland, Cal., and has formed an organization capitalized at $500,000. H. H. Whiting, president Best Steel Casting Co., which was absorbed by the new firm, stated that plans are complete for the construction of a foundry and that work will begin at once. The first unit will comprise 57,000 sq. ft. of floor space. This is exclusive of small buildings. The principal stockholders are from the East and include W. A. Forbes and G. O. Forbes of the Rockland Malleable Iron Works.

Test No. 40,000 was entered in the books of the Bureau of Standards, Department of Commerce, March 20, and was turned over to Dr. Gillett, the newly appointed chief of the Metallurgical Division. It consisted of nine samples of alloy steel from the Calorizing Co., Oliver Building, Pittsburgh. They are to be subjected to high tensile tests.

Public sale of the properties of the American Manganese Mfg. Co., Philadelphia, scheduled to take place Monday, March 31, at the office of Edward E. Marshall, Bullitt Building, Philadelphia, was postponed until April 28 at the same place. The company is in receivership and the sale is by court order. The properties include the Dunbar blast furnace.

STEEL PLANTS FLOODED

Production Decreased in Pittsburgh and Wheeling Districts—Rivers Receding

PITTSBURGH, April 1.—Melting snow and a heavy rain last Friday night have produced flood conditions in the local rivers, the like of which has not been experienced before since the spring of 1913 and this week's production of iron and steel at plants located near the river banks here and in the Wheeling district will be much affected.

The Jones & Laughlin Steel Corporation was obliged to suspend operation of its Soho blast furnace, steel works and finishing mills, this plant being located on Second Avenue, Pittsburgh, on the bank of the Monongahela River. Pennsylvania and Continental works of the National Tube Co., also located on Second Avenue, Pittsburgh, were flooded and forced down, as were most of its pipe furnaces at its National works, McKeesport, Pa., and at its Riverside works, Benwood, Wheeling, W. Va. Carnegie Steel Co. had to bank all of its Edgar Thomson blast furnaces at Braddock, Pa., and the American Steel & Wire Co. could not operate its Braddock and Rankin, Pa., plants as the water seeped into the mill pits. American Sheet & Tin Plate Co. was not able to start its plants at McKeesport, Pa.; Martins Ferry, Ohio, or LaBelle plant in Wheeling this week. Independent plants in the Steubenville-Wheeling district also lost some production because of the inundation.

The National Tube Co. also had one blast furnace at McKeesport and two at Benwood banked during the high stage of the flood. The Carnegie Steel Co. had to bank all of its blast furnaces at Edgar Thomson, Duquesne and Mingo works, but most of these furnaces again are in production.

As the rivers have already begun to recede, it is probable that the plants which have been forced down will be able to get going again before the end of the week, but the flood did considerable damage to railroads, notably along the southerly end of the Pittsburgh & Lake Erie Railroad and on the Baltimore & Ohio in the region of Cumberland, Md., which may result in some transportation difficulties for the next few weeks.

Jones & Laughlin Docks Approved

HARRISBURG, March 31.—The application of the Jones & Laughlin Steel Corporation for the construction of a transportation dock along the right bank of the Monongahela River at Pittsburgh has been approved by the Pennsylvania Water and Power Resources Board with certain restrictions relative to the establishment of channel lines. Application also was approved for the construction of loading and unloading station along the Ohio River at Woodlawn, Pa.

The applications were originally refused, but upon a reapplication and a new hearing at which the Pittsburgh Flood Commission and other organizations backed the plan for the docks, the board rescinded its former action. Members of the board felt that the flood control of the river would be endangered by the construction, but this was disclaimed by engineers for the steel company.

Hearing Relates to One Phase of Assigned Car Case

WASHINGTON, April 1.—The Interstate Commerce Commission has set April 23 as the date for a hearing concerning rules governing the ratings of bituminous coal mines. The proceeding is a phase of the assigned car case in which iron and steel manufacturers, particularly those owning private cars, were deeply interested. The present proceeding is intended to get reports from the railroads and the operators concerning the manner in which the new assigned car rules have worked out, and also to get views on the recommendation by the United States Coal Commission that the Interstate Commerce Commission allow the commercial ability to sell coal the year around to be the controlling influence in distribution of railroad cars in months of transportation shortage. The principle suggested is the controlling element in the distribution rules now in effect. A proposed code of mine rating rules embodying the principle recommended by the Coal Commission has been sent out by the Interstate Commerce Commission for study preliminary to the hearing.

The purpose of the recommendation with regard to the commercial ability of coal mines to sell their product the year around is to encourage the off season delivery and storage of bituminous coal.

More Hopeful Feeling at Youngstown Despite Price Recessions

YOUNGSTOWN, April 1.—A somewhat more hopeful outlook is voiced by sales executives of Valley iron and steel properties. An interest in the Newton Steel Co. states it has sufficient unfilled orders to maintain operations at a capacity rate through a large part of the second quarter.

A number of automobile makers have requested mills to hold up certain rolling orders, but these gaps have been immediately filled. The Ford Motor Co. has requested delay in rolling certain of its orders.

Pig iron prices have declined from $1 to $2 per ton, while heavy melting scrap is down, at $18, fully $5 from the recent peak price.

Plate buyers are exerting strong influence against present prices and there is irregularity in consequence. The same situation is true with respect to merchant steel bars and galvanized sheets.

The smaller sheet makers are accepting business freely at $2 per ton below the current quotations of the American Sheet & Tin Plate Co., and some of the larger makers are also shading the market.

Most of the plate tonnage now coming out is for railroad equipment and oil storage tanks for the Southwest.

Curtailment of Production in Mahoning Valley Continues

YOUNGSTOWN, April 1.—Further decline in active ingot capacity in the Mahoning Valley reflects downward tendencies in the iron and steel market, though some interests profess to note a modest improvement in business the past few days.

The number of active open-hearths this week is reduced to 33 of 51 independent units, for a total of 47 of 66 furnaces, including those operated by the Carnegie Steel Co. Last week 40 of the independent open-hearths were melting and 48 at the beginning of March. There was a progressive decline, therefore, last month in steel production.

All four Bessemer plants in the Youngstown district are active, however.

The Youngstown Sheet & Tube Co. is operating 13 of 24 open-hearths and the Republic Iron & Steel Co. eight of 13. The Sheet & Tube company has likewise suspended one of its Hubbard blast furnaces, cutting the number of active stacks in the district to 35, of 45. The Republic company is operating its Bessemer department at 80 per cent.

Rolling mill schedules, though, show little variation as compared with recent weeks. Of 120 sheet and jobbing mills in the Mahoning Valley, 100 are scheduled, and 16 of 17 tube mills.

The Rochester, N. Y., sheet metal workers' union has reached an agreement with employers on a new wage scale of $1.10 per hr., effective April 1. This is an increase of 10c. per hr. over the 1923 scale.

Prices Finished Iron and Steel f.o.b. Pittsburgh

Carload Lots

Plates

Sheared, tank quality, base, per lb.....2.30c. to 2.50c.

Structural Materials

Beams, channels, etc., base, per lb.....2.30c. to 2.50c.
Sheet piling .....2.45c. to 2.65c.

Iron and Steel Bars

Soft steel bars, base, per lb.....2.30c. to 2.40c.
Soft steel bars for cold finishing.....$3 per ton over base
Reinforcing steel bars, base.....2.40c.
Refined iron bars, base, per lb.....3.10c to 3.15c.
Double refined iron bars, base, per lb.....4.75c.
Stay bolt iron bars, base, per lb.....7.75c. to 8c.

Hot-Rolled Flats

Hoops, base, per lb.....2.90c. to 3.00c.
Bands, base, per lb.....2.90c. to 3.00c.
Strips, base, per lb.....2.75c. to 3.00c.

Cold-Finished Steel

Bars and shafting, base, per lb.....3c.
Bars and shafting, l.c.l., per lb.....3.25c.
Bars, S. A. E. Series, No. 2100.....4.75c.
Bars, S. A. E. Series, No. 2300.....6.25c. to 6.50c.
Bars, S. A. E. Series, No. 3100.....5.25c. to 5.50c.
Strips, base, per lb.....4.75c.

Wire Products

(To jobbers in car lots)

Nails, base, per keg.....$3.00
Galvanized nails, 1 in. and over.....$2.25 over base
Galvanized nails, less than 1 in..... 2.50 over base
Bright plain wire, base, No. 9 gage, per 100 lb.....$2.75
Annealed fence wire, base, per 100 lb..... 2.90
Spring wire, base, per 100 lb..... 3.70
Galvanized wire No. 9, base, per 100 lb..... 3.35
Galvanized barbed, base, per 100 lb..... 3.80
Galvanized staples, base, per keg..... 3.80
Painted barbed wire, base, per 100 lb..... 3.45
Polished staples, base, per keg..... 3.45
Cement coated nails, base, per count keg.....$2.50 to 2.60
Bale ties, carloads to jobbers.....75 and 2½ per cent off list
Woven fence, carloads (to jobbers).....67½ per cent off list
Woven fence, carloads (to retailers).....65 per cent off list

Bolts and Nuts

Machine bolts, small, rolled threads,
60, 10 and 10 per cent off list
Machine bolts, all sizes, cut threads.60 and 10 per cent off list
Carriage bolts, ⅜ x 6 in.:
Smaller and shorter, rolled threads.60 and 10 per cent off list
Carriage bolts, cut threads, all sizes,
50, 10 and 10 per cent off list
Lag bolts .....65 and 10 per cent off list
Plow bolts, Nos. 1, 2 and 3 heads....50 and 10 per cent off list
Other style heads .....20 per cent extra
Machine bolts, c.p.c. and t. nuts, ⅜ x 4 in.,
50 and 10 per cent off list
Larger and longer sizes.....50 and 10 per cent off list
Hot pressed squares or hex. nuts, blank.....4.50c. off list
Hot pressed nuts, tapped.....4.50c. off list
C.p.c. and t. square or hex. nuts, blank.....4c. to 4.25c.
C.p.c. and t. square or hex. nuts, tapped.....4c. to 4.25c.
Semi-finished hex. nuts:
⅞ in. and smaller, U. S. S.....80 and 5 per cent off list
1 in. and larger, U. S. S.....75 and 5 per cent off list
Small sizes, S. A. E.....80, 10 and 5 per cent off list
S. A. E., ⅝ in. and larger.....75, 10 and 5 per cent off list
Stove bolts in packages.....75, 10 and 5 per cent off list
Stove bolts in bulk.....75, 10, 5 and 2½ per cent off list
Tire bolts .....60 and 10 per cent off list
Bolt ends with hot pressed nuts.....60 and 5 per cent off list
Bolt ends with cold pressed nuts.....50 and 5 per cent off list
Turnbuckles, with ends, ½ in. and smaller,
50 to 55 and 5 per cent off list
Turnbuckles, without ends, ½ in. and smaller,
65 and 5 to 70 and 10 per cent off list
Washers .....5c. to 5.25c. off list

Semi-Finished Castellated and Slotted Nuts

(To jobbers and consumers in large quantities f.o.b. Pittsburgh.)

	Per 1000 S. A. E.	Per 1000 U. S. S.		Per 1000 S. A. E.	Per 1000 U. S. S.
¼-in.	$4.25	$4.25	7/8-in.	$13.25	$13.50
5/16-in.	4.90	4.90	15/16-in.	16.25	16.50
⅜-in.	5.90	6.25	1-in.	22.50	23.00
7/16-in.	7.50	8.50	1⅛-in.	34.00	34.00
½-in.	9.75	10.00	1-in.	53.00	55.00

Larger sizes—Prices on application.

Cap and Set Screws

Milled hex. head cap screws.....75, 10 and 5 per cent off list
Milled standard set screws, case hardened,
75, 10 and 5 per cent off list
Milled headless set screws, cut thread,
75, 10 and 5 per cent off list
Upset hex. head cap screws, U. S. S. thread,
80, 10 and 10 per cent off list
Upset hex. head cap screws, S. A. E. thread,
80, 10 and 10 per cent off list
Milled studs .....65 and 10 per cent of list

Rivets

Large structural and ship rivets, base, per 100 lb. $2.65 to $2.75
Small rivets .....70 and 10 per cent off list

Track Equipment

Spikes, ⅜ in. and larger base, per 100 lb..... $3.00
Spikes, ½ in., 7/16 in. and ⅝ in., per 100 lb.....$3.25 to 3.50
Spikes, 7/16 in..... 3.25 to 3.50
Spikes, boat and barge, base, per 100 lb..... 3.25 to 3.50
Track bolts, ¾ in. and larger, base, per 100 lb.. 4.00 to 4.25
Track bolts, ½ in. and ⅝ in., base, per 100 lb.. 4.50 to 5.00
Tie plates, per 100 lb..... 2.60
Angle bars, base, per 100 lb..... 2.75

Welded Pipe

Butt Weld

Steel Inches	Black	Galv.	Iron Inches	Black	Galv.
⅛	45	19½	¼ to ⅜	+11	+35
¼ to ⅜	51	25½	½	22	2
½	56	42½	¾	28	11
¾	60	48½	1 to 1½	30	13
1 to 3	62	50½			

Lap Weld

2	55	43½	2	23	7
2½ to 6	59	47½	2½	26	11
7 and 8	56	43½	3 to 6	28	13
9 and 10	54	41½	7 to 12	26	11
11 and 12	53	40½			

Butt Weld, extra strong, plain ends

⅛	41	24½	2 to 3	61	50½
¼ to ⅜	47	30½	¼ to ⅜	+19	+54
½	53	42½	½	21	7
¾	58	47½	¾	28	12
1 to 1½	60	49½	1 to 1½	30	14

Lap Weld, extra strong, plain ends

2	53	42	2	23	9
2½ to 4	57	46½	2½ to 4	29	15
4½ to 6	56	45½	4½ to 6	28	14
7 to 8	52	39½	7 to 8	21	7
9 and 10	45	32½	9 to 12	16	2
11 and 12	44	31½			

To the large jobbing trade the above discounts are increased by one point, with supplementary discount of 5 per cent on black and 1½ points, with a supplementary discount of 5 per cent on galvanized.

Boiler Tubes

Lap Welded Steel		*Charcoal Iron*	
2 to 2¼ in.	27	1¼ in.	+18
2½ to 2¾ in.	37	1¾ to 1⅞ in.	+ 8
3 in.	40	2 to 2¼ in.	— 2
3¼ to 3¾ in.	42½	2½ to 3 in.	— 7
4 to 13 in.	46	3¼ to 4½ in.	— 9

Less carload lots 4 points less.

Standard Commercial Seamless Boiler Tubes

Cold Drawn			
1 in.	55	3 and 3¼ in.	36
1¼ and 1½ in.	47	3½ and 3¾ in.	37
1¾ in.	31	4 in.	41
2 and 2¼ in.	22	4½ in. and 5 in.	33
2½ and 2¾ in.	32		
Hot Rolled			
3 and 3¼ in.	38	4 in.	43
3½ in. and 3¾ in...	39		

Less carloads, 4 points less. Add $8 per net ton for more than four gages heavier than standard. No extra for lengths up to and including 24 ft. Sizes smaller than 1 in. and lighter than standard gage to be held at mechanical tube list and discount. Intermediate sizes and gages not listed take price of net larger outside diameter and heavier gage.

Seamless Mechanical Tubing

Carbon under 0.30, base.....85 per cent off list
Carbon 0.30 to 0.40, base.....83 per cent off list
Plus usual differentials and extras for cutting. Warehouse discounts range higher.

Seamless Locomotive and Superheater Tubes

	Cents per Ft.		Cents per Ft.
2-in. O.D. 12 gage	15	2¼-in. O.D. 10 gage	20
2-in. O.D. 11 gage	16	3-in. O.D. 7 gage	35
2-in. O.D. 10 gage	17	1½-in. O.D. 9 gage	15
2¼-in. O.D. 12 gage	17	5¾-in. O.D. 9 gage	55
2¼-in. O.D. 11 gage	18	5½-in. O.D. 9 gage	57

Tin Plate

Standard cokes, per base box.....$5.50

Terne Plate

(Per Package, 20 x 28 in.)

8-lb. coating, 100 lb. base	$11.00	20-lb. coating I. C.	$14.90
8-lb. coating I. C.	11.30	25-lb. coating I. C.	16.20
12-lb. coating I. C.	12.70	30-lb. coating I. C.	17.35
15-lb. coating I. C.	13.95	35-lb. coating I. C.	18.35
		40-lb. coating I. C.	19.35

Sheets

Blue Annealed

Nos. 9 and 10 (base), per lb.....2.90c. to 3c.
Box Annealed, One Pass Cold Rolled
No. 28 (base), per lb.....3.75c. to 3.85c.
Automobile Sheets
Regular auto body sheets, base (22 gage), per lb.....5.35c.
Galvanized
No. 28 (base), per lb.....4.90c. to 5c.
Long Ternes
No. 28 gage (base), 8-lb. coating, per lb.....5.30c.
Tin-Mill Black Plate
No. 28 (base), per lb.....3.85c.

Prices of Raw Materials, Semi-Finished and Finished Products

Ores

Lake Superior Ores, Delivered Lower Lake Ports

Old range Bessemer, 55 per cent iron	$6.45
Old range non-Bessemer, 51½ per cent iron	5.70
Mesabi Bessemer, 55 per cent iron	6.20
Mesabi non-Bessemer, 51½ per cent iron	5.55

Foreign Ore, per Unit, c.i.f. Philadelphia or Baltimore

Iron ore, low phos., copper free, 55 to 58 per cent iron in dry Spanish or Algerian	11.00c.
Iron ore, Swedish, average 66 per cent iron	9.50c.
Manganese ore, washed, 51 per cent manganese, from the Caucasus, nominal	45c.
Manganese ore, ordinary, 48 per cent manganese, from the Caucasus	42c.
Manganese ore, Brazilian or Indian, nominal	42c.
Tungsten ore, per unit, in 60 per cent concentrates	$8.25 to $10.00
Chrome ore, basic, 48 per cent Cr_2O_3, crude, per ton, c.i.f. Atlantic seaboard	18.00 to 28.00
Molybdenum ore, 85 per cent concentrates, per lb. of MoS_2, New York	75c. to 85c.

Ferroalloys

Ferromanganese, domestic, 80 per cent, furnace, or seaboard, per ton	$107.50
Ferromanganese, British, 80 per cent f.o.b. Atlantic port, duty paid	107.50
Ferrosilicon, 50 per cent, delivered	75.00
Ferrosilicon, 75 per cent	140.00
Ferrotungsten, per lb. contained metal	85c. to 90c.
Ferrochromium, 4 to 6 per cent carbon, 60 to 70 per cent Cr. per lb. contained Cr. delivered	10.75c.
Ferrochromium, 6 to 7 per cent carbon, 60 to 70 per cent Cr., per lb	10.50c.
Ferrovanadium, per lb. contained vanadium	$3.50 to $4.00
Ferrocarbontitanium, 15 to 18 per cent, per net ton	200.00

Spiegeleisen, Bessemer Ferrosilicon and Silvery Iron

(Per gross ton furnace unless otherwise stated)

Spiegeleisen, domestic, 19 to 21 per cent, $38.00 to $40.00
Spiegeleisen, domestic, 16 to 19 per cent, 37 to 38.00
Ferrosilicon, Bessemer, 10 per cent, $41.50; 11 per cent, $44; 12 per cent, $46.50; 14 to 16 per cent, (electric furnace) $40.00.
Silvery iron 5 per cent, $29.00; 6 per cent, $30.00; 7 per cent, $31.00; 8 per cent, $32.50; 9 per cent, $34.50; 10 per cent, $36.50; 11 per cent, $39.00; 12 per cent, $41.50.

Fluxes and Refractories

Fluorspar, 80 per cent and over calcium fluoride, not over 5 per cent silica, per net ton f.o.b. Illinois and Kentucky mines	$19.00 to $22.00
Fluorspar, 85 per cent and over calcium fluoride, not over 5 per cent silica, per net ton f.o.b. Illinois and Kentucky mines	22.00 to 23.50

Per 1000 f.o.b. works:

Fire Clay	High Duty	Moderate Duty
Pennsylvania	$42.00 to $45.00	$37.00 to $42.00
Maryland	47.00	42.00
Ohio	42.00 to 43.00	37.00 to 39.00
Kentucky	42.00 to 43.00	37.00 to 39.00
Illinois	——	37.00 to 42.00
Missouri	42.00 to 45.00	35.00 to 40.00
Ground fire clay, per net ton		6.00 to 7.00
Silica Brick:		
Pennsylvania		38.00 to 40.00
Chicago		49.00
Birmingham		50.00
Ground silica clay, per net ton		8.00
Magnesite Brick:		
Standard size, per net ton (f.o.b. Baltimore and Chester, Pa.)		65.00
Grain magnesite, per net ton (f.o.b. Baltimore and Chester, Pa.)		40.00
Chrome Brick:		
Standard size, per net ton		47.00

Semi-Finished Steel, F.O.B. Pittsburgh or Youngstown, per gross ton

Rolling billets, 4-in. and over	$40.00
Rolling billets, 2-in. and under	40.00
Forging billets, ordinary carbons	45.00
Sheet bars, Bessemer	42.50
Sheet bars, open-hearth	42.50
Slabs	40.00
Wire rods, common soft, base, No. 5 to ⅝-in.	51.00
Wire rods, common soft, coarser than ⅜-in.	$2.50 over base
Wire rods, screw stock	$5.00 per ton over base
Wire rods, carbon, 0.20 to 0.40	3.00 per ton over base
Wire rods, carbon 0.41 to 0.55	5.00 per ton over base
Wire rods, carbon 0.56 to 0.75	7.50 per ton over base
Wire rods, carbon over 0.75	10.00 per ton over base
Wire rods, acid	15.00 per ton over base
Skelp, grooved, per lb	2.30c.
Skelp, sheared, per lb	2.30c.
Skelp, universal, per ton	2.30c.

Finished Iron and Steel, F.O.B. Mill

Rails, heavy, per gross ton	$43.00
Rails, light, new steel, base, lb	2c. to 2.15c.
Rails, light, rerolled, base, per lb	1.85c. to 2.00c.
Spikes, ⅝-in. and larger, base, per 100 lb	$3.00
Spikes, ½-in. and smaller, base, per 100 lb	$3.25 to 3.50
Spikes, boat and barge, base, per 100 lb	3.25 to 3.50
Track bolts, ⅝-in. and smaller, base, per 100 lb.	4.00 to 4.25
Track bolts, ¾-in. and larger, base, per 100 lb.	4.50 to 5.00
Tie plates, per 100 lb	2.60
Angle bars, per 100 lb	2.75
Bars, common iron, base, per lb., Chicago mill	2.40c.
Bars, common iron, Pittsburgh mill	2.40c.
Bars, rail steel reinforcing, base, per lb	2.10c. to 2.15c.
Rail steel bars, base, per lb., Chicago mill	2.30c.
Cold finished steel bars, base, Chicago, per lb.	3c.
Ground shafting, base, per lb	3.40c.
Cut nails, base, per keg	$3.00 to $3.15

Alloy Steel

S. A. E. Series Numbers	Bars 100 lb.
2100*(½% Nickel, 10 to 20 per cent Carbon)	$3.50
2300 (3½% Nickel)	5.00
2500 (5% Nickel)	$6.50 to 7.00
3100 (Nickel Chromium)	4.00
3200 (Nickel Chromium)	5.75 to 6.00
3300 (Nickel Chromium)	8.00 to 8.25
3400 (Nickel Chromium)	7.00 to 7.25
5100 (Chromium Steel)	3.75
5200*(Chromium Steel)	7.50 to 8.00
6100 (Chromium Vanadium bars)	4.75 to 5.00
6100 (Chromium Vanadium spring steel)	4.50 to 4.75
9250 (Silicon Manganese spring steel)	3.75 to 4.00
Nickel Chrome Vanadium (0.60 Nickel, 0.50 Chromium, 0.15 Vanadium)	4.75
Chromium Molybdenum bars (0.80—1.10 Chromium, 0.25—0.40 Molybdenum)	4.50 to 4.75
Chromium Molybdenum bars (0.50—0.70 Chromium, 0.15—0.25 Molybdenum)	4.25
Chromium Molybdenum spring steel (1—1.25 Chromium, 0.30—0.50 Molybdenum)	4.75 to 5.00

Above prices are for hot-rolled alloy steel bars, forging quality, per 100 lb., f.o.b. Pittsburgh. Billets 4 x 4 in. and larger are $10 per gross ton less than net ton price for bars of same analysis. On smaller than 4 x 4-in. billets the net ton bar price applies.

*Not S.A.E. specifications, but numbered by manufacturers to conform to S.A.E. system.

Freight Rates

All rail freight rates from Pittsburgh on finished iron and steel products, carload lots, 36,000 lb. minimum carload, per 100 lb.:

Philadelphia, domestic	$0.32	Buffalo	$0.265	St. Louis	$0.43	*Pacific Coast	$1.15
Philadelphia, export	0.235	Cleveland	0.215	Kansas City	0.735	*Pac. Coast, ship plates	1.20
Baltimore, domestic	0.31	Cleveland, Youngstown Comb.	0.19	Kansas City (pipe)	0.705	Birmingham	0.58
Baltimore, export	0.225	Detroit	0.29	St. Paul	0.60	Memphis	0.56
New York, domestic	0.34	Cincinnati	0.29	Omaha	0.735	Jacksonville, all rail	0.70
New York, export	0.255	Indianapolis	0.31	Omaha	0.705	Jacksonville, rail and water	0.415
Boston, domestic	0.365	Chicago	0.34	*Denver	1.15	New Orleans	0.67
Boston, export	0.255			†Denver (pipe)	1.17		

*Applies minimum carload 80,000 lb. †Minimum loading 46,000 lb.

Rates from Atlantic Coast ports (i.e., New York, Philadelphia and Baltimore) to Pacific Coast ports of call on most steamship lines, via the Panama Canal, are as follows: Pig iron, 35c.; ship plates, 40c.; ingots and muck bars, structural steel, common wire products, including cut or wire nails, spikes, and wire hoops, 40c.; sheets and tin plates, 40c.; sheets No. 12 gage and lighter, 50c.; rods, 40c.; wire rope cables and strands, 45c.; wire fencing, netting and stretcher, 40c.; pipes not over 12 in. in diameter, 55c.; over 12 in. in diameter, 2½c. per in. or fraction thereof additional. All rates per 100 lb. in carload lots, minimum 36,000 lb.

FABRICATED STEEL BUSINESS

Bookings of 28,000 Tons and New Projects Calling for 33,000 Tons

Railroad work accounted for one-third of the past week's bookings of nearly 28,000 tons of structural steel construction and for somewhat more than one-third of the 33,000 tons of fresh inquiries covering sizable jobs. Awards include the following:

Loft building, 7-9 West Thirty-sixth Street, New York, 750 tons, to Taylor-Fichter Steel Construction Co.

Office building, East Twenty-sixth Street, New York, 350 tons, to Harris Structural Steel Co.

Springfield, Mass., bridge over Connecticut River, 3000 tons, to American Bridge Co.

Standard Oil Co. of Louisiana, storage tanks to be erected in Louisiana, 1000 tons, to unnamed fabricator.

Long Island Railroad, bridge, 150 tons, to Shoemaker Bridge Co.

Charleston, S. C., Port Utilities Commission, pier shed, 400 tons, to Austin Bridge Co.

Aberthaw Co., job at High Shoals, S. C., 300 tons, to unnamed fabricator.

Oxford Paper Co., Rumford, Maine, addition to plant, 250 tons, to American Bridge Co.

Wabash Railroad, steel coach shop at East Decatur, Ill., 400 tons, to Mississippi Structural Steel Co.

Conestoga Terminal, Lancaster, Pa., 900 tons, to American Bridge Co.

Indiana Electric Co., power plant at Macksville, Ind., Stone & Webster, general contractors, 1000 tons, to unnamed fabricator.

Florida East Coast Railroad, bridge over St. Johns River, Florida, 4800 tons, to Phoenix Bridge Co.

Office building, Thirty-eighth Street, New York, 300 tons, to Paterson Bridge Co.

Apartment building, West Fifty-fifth Street, New York, 400 tons, to Paterson Bridge Co.

Loft building, West Thirtieth Street, New York, 750 tons, to Hinkle Iron Co.

Southern California Telephone Co. building, Los Angeles, 1963 tons, to American Bridge Co.

Chicago & North Western, 1924 bridge requirements, 2000 tons, to American Bridge Co.

Kansas City, Mo., reconstruction Blue River bridge over Independence Road, 222 tons, to Wisconsin Bridge & Iron Co.

Magnolia Petroleum Co., 10 tanks for Powell, Tex. field, 1600 tons, to Mt. Cooper Boiler & Iron Co.

Great Northern, 100-ft. twin span turntable, 100 tons, to Bethlehem Steel Co.

Washington school auditorium, Indiana Harbor, Ind., 350 tons, to A. Bolsters Sons Co.

Ford Motor Co., assembly plant at Louisville, Ky., 2025 tons, to McClintic-Marshall Co.

Minneapolis Gas & Light Co., gas holder, 100 tons, to Stacey Mfg. Co.

Youngstown Sheet & Tube Co., skip, cast house and tipple, at Indiana Harbor, 500 tons, to Worden-Allen Co.

Roberts & Schaefer, Hiawatha, Utah, coal tipple, 150 tons, to Worden-Allen Co.

Cadillac Motor Car Co., Detroit, foundry buildings, 1300 tons, to Whitehead & Kealey.

New York Central Railroad car dumper, 700 tons, to McMyler Interstate Co.

Libby Owens Sheet Glass Co., Toledo, 1500 tons, general contract awarded to Bentley & Sons.

Structural Projects Pending

Inquiries for fabricated steel work include the following:

Baltimore & Ohio Railroad, bridges, 5200 tons.

Hotel Poinsett, Greenville, S. C., 1200 tons.

Alexander Hamilton Hotel, Paterson, N. J., 1000 tons; former bids rejected.

Virginian Railroad, bridges in West Virginia, 1500 tons.

Federal American National Bank Building, Washington, D. C., 400 tons.

Central Railroad of New Jersey, mentioned last week as being in the market for 20,000 tons of steel for bridge across Newark Bay, is first taking bids on the lift spans, 10,000 tons.

City of New York, bridge over Jamaica Boulevard, Long Island, 600 tons.

City of New York, school building No. 28, Brooklyn, 800 tons.

Santa Fe, general bridge requirements, 3650 tons, signal bridges, 350 tons, and sand blast and paint building, Topeka, Kan., 300 tons.

Wabash, 2 through plate girder spans, 150 tons.

Jones & Laughlin Steel Corporation, Pittsburgh, ore bridge, 755 tons.

Great Western Paper Co., power house, Ladysmith, Wis., 100 tons.

Atlantic City, N. J., bascule bridge, 100 tons; E. L. Shaw Co., Chicago, engineer.

Chicago, theater and office building, La Salle and Randolph Streets, 6300 tons.

Portland, Me., apartment hotel, 583 tons; previously reported as 300 tons.

Maine Central Railroad, bridges at Lewiston and Waterville, Me., 650 tons.

Exchange Street Trust Co., Boston, bank, 550 tons.

Wool combing plant, North Smithfield, R. I., 425 tons.

Edison Electric Illuminating Co. plant, Boston, 250 tons.

State of Massachusetts, bridge at Wilbraham, 250 tons.

Woonsocket, R. I., hospital, 100 tons.

U. S. Engineers' Office, Florence, Ala., 58 sluice gates, approximately 2000 tons, bids close April 26.

Masonic Temple, Springfield, Ohio, 900 tons, bids close April 24.

Miami University, Oxford, Ohio., recitation building, estimated 200 tons, bids being taken.

First National Bank building, Huntington, W. Va., 600 tons, bids asked.

U. S. Engineers' Office, Louisville, Ky., lock No. 50, Ohio River, 800 tons, bids close April 25.

Dunkirk, N. Y., high school, 400 tons, bids in April 8.

Akron, Ohio, City Hall, 900 tons.

Liberty Bank, Buffalo, 4100 tons, previously reported as 2000 tons.

RAILROAD EQUIPMENT BUYING

Orders for 700 Cars and 50 Locomotives and Inquiries for 1000 Cars

The items below show that orders came to light in the past week for 700 cars and 50 locomotives and that fresh inquiries appeared for 1000 freight cars and 11 locomotives.

The Florida East Coast Railroad has placed an order for 25 locomotives with the American Locomotive Co.

The Southern Railway has ordered 20 locomotives from the American Locomotive Co. and 5 from the Baldwin Locomotive Works.

The Great Northern has placed 250 ore cars with the Bethlehem Steel Co.

The Kingan Refrigerator Line, Indianapolis, Ind., has ordered 100 refrigerator cars from the American Car & Foundry Co.

The Southern has placed 250 additional gondola cars with the Chickasaw Shipbuilding & Car Co., making a total of 1500 gondola cars awarded to that car builder.

The Davis Equipment Co., 30 Church Street, New York, is inquiring for 8 4-wheel saddle tank locomotives, standard gage, 40 to 60 tons capacity.

The Kansas City, Mexico & Orient contemplates the purchase of 500 box, 250 stock and 250 gondola cars.

The New York Central is inquiring for 3 Mallet-type locomotives.

Swift & Co., Chicago, will build 100 stock cars in its own shops.

Steel furniture shipments in February are reported by the Department of Commerce at $1,605,409, compared with $1,592,338 in January and with $1,307,173 in February, 1923. The current figures are the highest of the past two years, with the exception of last March, when the total was reported at $1,709,206. The average month in 1923 showed $1,402,919, while 1922 showed an average of $1,077,335 per month.

According to officials of the American Puddled Iron Co., Youngstown, Ohio, the iron made at the company's plant in Warren by the mechanical puddling process invented by E. L. Ford, Youngstown, is of uniform quality and is up to expectations. The company is operating one shift at present and is accumulating iron to start the rolling mills in the near future. Operations are being limited at this time until the men become educated in handling the machinery.

NON-FERROUS METALS

The Week's Prices

Cents per Pound for Early Delivery

	Copper, New York		Straits Tin (Spot)	Lead		Zinc	
March	Lake	Electrolytic*	New York	New York	St. Louis	New York	St. Louis
26.....	13.75	13.37½	51.12½	9.00	8.80	6.67½	6.32½
27.....	13.62½	13.25	52.00	9.00	8.75	6.67½	6.32½
28.....	13.62½	13.00	50.50	9.00	8.70	6.65	6.30
29.....	13.62½	12.87½	....	9.00	8.70	6.65	6.30
31.....	13.62½	13.25	49.00	9.00	8.70	6.60	6.25
April 1.....	13.75	13.37½	50.62½	9.00	8.70	6.57½	6.22½

*Refinery quotation; delivered price ¼c. higher.

New York

NEW YORK, April 1.

The markets are all quiet and most of them are easier. Copper, after declining further, is again firmer. Tin continues to decline, with buying moderate. The lead market is decidedly easier. Zinc continues to go lower, unsupported by any demand.

Copper.—The electrolytic copper market fell toward the end of last week to still lower levels on this movement, sales having been made as low as 13.12½c., delivered. One explanation of this decline is offered as the falling off in orders of copper consuming companies. Since the low point the market has turned higher and there has been considerable inquiry as well as selling for both foreign and domestic account. As has frequently happened before, foreign buyers who are regarded as keen observers of the market placed orders at what they felt was the bottom, and this is offered as one explanation of the advance which is now in progress. Yesterday there was some substantial business booked at 13.50c. to 13.62½c., delivered, with fairly liberal inquiry, and the same has been true of today's market, except that by the close the market was stronger, with the minimum regarded as 13.62½c., delivered, firmly established by sales. The foreign buying is reported as quite general from European countries and from the Far East, and the prospect for further business, particularly from Germany, is good. While the domestic outlook is not quite as satisfactory as in the past, consumers are placing orders at what appear to be low levels. Lake copper is largely nominal at 13.62½c. to 13.75c., delivered.

Copper Averages.—The average price of Lake copper for the month of March, based on daily quotations in THE IRON AGE, was 13.97c. The average price of electrolytic copper was 13.52c., refinery, or 13.77c., delivered.

Tin.—Spot Straits tin continues to decline and has finally fallen below 50c. in New York, or more than 10c. below the level two weeks ago. Indications are strong that the bull crowd in the tin market has sold out, as they are not supporting it. The outstanding feature is the continued refusal of consumers to buy in quantity on the decline. One authoritative opinion is to the effect that consumers are well covered for all their April and May requirements, which is better than many in the trade thought to be the case. It is argued that the same mistake is being made by some market observers this time that was made last year when the extent of the buying by consumers was underestimated, except that the amount of covering by consumers has not been as far ahead this time as last year. Sales for the week ended Friday, March 28, are estimated at about 1300 tons, with 700 tons of this sold on March 27, dealers being the buyers. On Wednesday, March 26, there were sales of 150 to 200 tons and the market appeared quite strong, but by Friday it became weak, with sellers at 50.62½c. The movements of the market yesterday were uncertain, there being talk of sales of 250 tons, but this was not definite. On the whole, quietness has pervaded the market yesterday and today. Spot Straits tin was quoted at 50.62½c., New York, today, largely nominal, but higher than yesterday because of strength in London. The London quotations were at £257 10s. for spot standard, £256 10s. for future standard, and £259 10s. for spot Straits, all £4 to £5 per ton lower than a week ago. Deliveries of tin into consumption during March are returned as 4560 tons, with 1802 tons reported in stock and landing on March 31. Imports for the first quarter are given as 18,450 tons, of which 3060 tons came in during March. The quantity of tin afloat is reported as 8980 tons.

Lead.—The market is quiet and dull and prices are easier. The leading interest continues to quote 9c., New York, as its contract price. In the outside market this can be shaded slightly at 8.87½c. to 9c., with the St. Louis price ranging from 8.65c. to 8.75c. Buying is still light, although consumption is unchanged in its large volume. The market continues to be somewhat affected by the market in London and there is also some increase in production.

Zinc.—Absence of demand by domestic consumers, no activity on the part of dealers, and offerings in this market by London operators have combined to force the price of prime Western to lower levels. For April and May shipment this grade of zinc is quoted at 6.20c. to 6.25c., St. Louis, or 6.55c. to 6.60c., New York, at which levels light sales have been made. These prices contrast with 6.75c. to 6.80c., St. Louis, early in March.

Nickel.—Shot and ingot nickel are quoted unchanged at 29c. to 32c. per lb., with electrolytic nickel held at 32c. by the leading producers. In the outside market both shot and ingot nickel are quoted at 28c. to 32c. per lb.

Antimony.—Offerings in the East are more liberal and this has affected the market there in that Chinese metal in wholesale lots is quoted lower at 11.75c., New York, duty paid, with the probability that 11.50c. could be done.

Aluminum.—Virgin metal, 98 to 99 per cent pure, is quoted at 28c. per lb., duty paid, delivered, by importers who are able to obtain it from their foreign principals. Quotations by the leading domestic producer are not made public.

Old Metals.—Demand is poor and prices are off. Dealers' selling prices are as follows:

	Cents Per Lb.
Copper, heavy and crucible	13.00
Copper, heavy and wire	12.00
Copper, light and bottoms	11.00
Heavy machine composition	10.75
Brass, heavy	8.50
Brass, light	7.00
No. 1 red brass or composition turnings	9.50
No. 1 yellow rod brass turnings	8.25
Lead, heavy	7.75
Lead, tea	6.50
Zinc	4.75
Cast aluminum	18.50
Sheet aluminum	18.50

Chicago

APRIL 1.—Weakness is pronounced in all of the metals. Tin has dropped sharply and declines have been registered in copper, lead, zinc and antimony. For the first time in months better supplies of antimony are in sight from the Far East. We quote in carload lots: Lake copper, 13.75c.; tin, 51c.; lead, 8.65c.; spelter, 6.30c.; antimony, 12.50c., in less than carload lots. On old metals we quote copper wire, crucible shapes and copper clips, 11c.; copper bottoms, 9.50c.; red brass, 9c.; yellow brass, 7.25c.; lead pipe, 6.50c.; zinc, 4c.; pewter, No. 1, 30c.; tin foil, 35c.; block tin, 40c.; all buying prices for less than carload lots.

The new sheet mill at the Pittsburg, Cal., plant of the Columbia Steel Corporation is now in operation, with a working force of about 200 men. Publication has been made from time to time concerning the work of enlarging the Pittsburg plant, which has been under way in the past year. The additions include two 75-ton basic open-hearth furnaces, a wire rod mill and wire nail mills. At the recent convention of California retail hardware dealers in San Francisco the company showed two of its nail machines in operation. The sheet mill consists of four stands.

PERSONAL

W. W. Arpe has resigned as assistant manager of sales of the Carnegie Steel Co., Illinois Steel Co. and Tennessee Coal, Iron & Railroad Co. for the St. Louis district, to become special agent of the Laclede Steel Co., with offices in St. Louis. Mr. Arpe began his steel career in 1901 at the Western Tube Co. plant of the National Tube Co., Kewanee, Ill. In 1906 he had charge of pig iron sales in St. Louis for the Tennessee Coal, Iron & Railroad Co., which was then owned by the Republic Iron & Steel Co. In 1907, when the Tennessee company was taken over by the United States Steel Corporation, he became connected with the latter organization. On Feb. 1, 1922, he was appointed to the position he has just left.

W. W. ARPE

John E. Allen has been appointed sales manager of the Boston district for the Union Drawn Steel Co., Beaver Falls, Pa., succeeding the late Karl W. Moynes.

C. I. Sprowl, for 23 years identified with the sheet steel industry, a little over half the time with the American Sheet & Tin Plate Co., and the remainder with the American Rolling Mill Co., has established himself in business with headquarters at Ridgewood, N. J., to serve as adviser to consumers of sheet metal products regarding available material for special uses, with the idea that he can readily supply the special sizes and qualities sometimes needed without the consumers accepting material which may represent unnecessary waste.

H. L. Gilliam, formerly district sales manager at Norfolk, Va., for the Wood Shovel & Tool Co., Piqua, Ohio, is now in charge of the New York office, 50 Church Street. He will have charge of the hardware trade, previously served by J. C. McCarty & Co., and the railroad trade, which was in charge of H. H. French.

Robert E. Kearney of the New York branch of the Electric Storage Battery Co., Philadelphia, delivered a talk at the radio station WJY, New York, April 1, on "Industrial Trucks and Tractors in Civil Pursuits."

Zenas W. Carter, who has just completed the special bus promotion program of the White Motor Co., is now associated with the Erickson Co., New York advertising agency. During the war he was chairman of the war service committee on metal lath, stationed at Washington. He originated and developed the publicity and sales plans of the Granite Paving Block Manufacturers' Association. He was also in charge of the development and management of the national program of promotion for the Material Handling Manufacturers' Association.

E. C. Myers has been appointed to the San Francisco office, with headquarters at 320 Rialto Building, of the Falk Corporation, Milwaukee. He is a graduate of Syracuse University, where he took the four-year electrical engineering course. For several years he was with the General Electric Co., first at Schenectady, then for about ten years in San Francisco. About a year ago he opened a New York office for Cotton, Neill & Co., Ltd. His new territory will include the States of California, Oregon and Washington. Charles C. Walsh has been appointed Detroit representative of the Falk Corporation, with offices at 1500 Real Estate Exchange Building. He received his engineering education at Highland Park College, Des Moines, Iowa, and his subsequent career includes service with the Michigan Central Railroad at Detroit, the Morgan-Wright Rubber Works, Detroit, the S. K. F. Ball Bearing Co. and the W. C. DuComb Co. His territory includes Michigan and northwestern Ohio.

Charles Longenecker, formerly sales engineer with the Bonnot Co. at Canton, Ohio, has become associated with the Combustion Engineering Corporation, 43 Broad Street, New York. He was one of the first men to specialize in pulverized fuel and has been active in this field for many years. His efforts have been directed particularly along the line of industrial application to boilers and furnaces. In his new connection he will be identified with the recently created industrial department, which will specialize in the application of pulverized fuel to industrial work of all kinds.

C. A. Wills, general plant foreman of the William B. Pollock Co., Youngstown, Ohio, has been appointed general superintendent, succeeding John Kirby, who died recently.

C. F. Blue, Jr., has been elected a director and vice-president of the Climax Molybdenum Co., 61 Broadway, New York. Mr. Blue, whose headquarters will be in Pittsburgh, has been connected with the manufacture of steel and castings during his entire career. He was formerly president of the Carbon Steel Co., one of the first steel mills to produce molybdenum steels in large quantities in the United States. He was also formerly vice-president of the Pittsburgh Iron & Steel Foundry Co., a large producer of alloy steel rolls and castings. He will devote his entire time to the sale and development of molybdenum.

N. W. Foster, who has been assistant treasurer of the National Acme Co. at its Windsor, Vt., plant, was elected vice-president and general manager of the company's plants at the annual meeting on March 27. He will make headquarters in Cleveland. Heretofore, the company has not had an executive with the title of general manager. The board of directors was increased from nine to 11. J. O. Eaton, president Eaton Axle & Spring Co., was elected to the board to succeed W. F. McGuire of New York, who resigned. Mr. Foster and O. L. Henn, who recently was made general superintendent of the Stanton Road plant, also were elected new directors. Daniel H. Parker was elected assistant treasurer at Windsor. A. W. Henn was reelected president and treasurer, and N. S. Rathburn, secretary and assistant treasurer.

H. C. Richardson has been appointed district sales manager at Cleveland, for the Donner Steel Co. He has been with the Donner company nearly two years and was formerly with the United Alloy Steel Corporation. His offices in Cleveland are in the Union Trust Building.

W. V. Wrightson has been transferred from the Boston office of the Bethlehem Steel Co. to the Pittsburgh office, taking the place of E. B. C. Goyne, recently transferred to the company's Cincinnati office. Before going to Boston, he had practical mill experience at Sparrows Point, Md., and prior to joining the Bethlehem Steel Co., was connected with the National Tube Co.

Joseph D. Morten has been elected vice-president of the Domhoff & Joyce Co., pig iron and coke merchants, with head offices at Cincinnati. Mr. Morten is one of the best known pig iron salesmen of the Middle West and has been connected with the iron and steel business for the past 21 years. For several years he was engaged in business journalism, and then joined the firm of Walter-Wallingford & Co. in a sales capacity covering the Cincinnati, Cleveland, Indianapolis and Chicago territories. After three years with this company he resigned to become sales manager of the Domhoff & Joyce Co., in which connection he has had at various periods direct charge of the branch sales offices of the company at Indianapolis, Chicago and New York. Besides the duties of his new position, Mr. Morten will continue in charge of sales of the company.

Albert Walton has been elected vice-president in charge of manufacturing, and member of the board

of directors of the Enterprise Mfg. Co., Philadelphia, manufacturer of hardware, coffee mills, etc.

John B. Hecht, formerly with John J. Kane, scrap iron dealer, Philadelphia, has joined the organization of the Perry, Buxton, Doane Co., Pennsylvania Building, Philadelphia.

Frank Krause, formerly in the general sales office of the Midvale Steel & Ordnance Co., who went to Bethlehem, Pa., following the absorption of the Midvale company by the Bethlehem Steel Co., has been transferred to the Philadelphia sales offices of the Bethlehem Steel Co.

R. M. Taylor, for two years in the Philadelphia office of Hickman, Williams & Co., and for four and a half years in the Pittsburgh office of the same firm, has resigned.

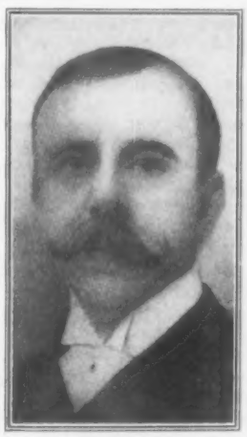
Walter D. Briggs has been transferred from the Boston to the Syracuse, N. Y., office of Henry Prentiss & Co., machine-tool dealers, and will cover the Southern New York, Scranton and Wilkes-Barre, Pa., territories.

James A. Long has been appointed general manager of the Woodward Iron Co., Woodward, Ala., succeeding A. J. Boynton, who has become associated with H. A. Brassert, Inc., Chicago.

OBITUARY

John G. A. Leishman

JOHN G. A. LEISHMAN, one time partner of Andrew Carnegie, and who resigned as president of the Carnegie Steel Co. in 1897 to enter the diplomatic service of the Government, died March 27 in a hotel in Monte Carlo. Death was attributed to heart disease. Mr. Leishman was born in Pittsburgh, March 28, 1857, and besides his prominence in the iron and steel business came to notice as one who helped to overpower the anarchist Berkman when he attacked the late Henry C. Frick at the time of the Homestead strike of 1892. He was appointed American Minister to Switzerland in 1897 by President McKinley and continued in the diplomatic service until 1913, when he retired and since lived abroad. He was transferred to Turkey in 1901 and served as minister and ambassador to that country until 1909, when he was named ambassador to Italy. Mr. Leishman was named ambassador to Germany in 1911, where he remained until 1913. He was the senior member of the firm of Leishman & Snyder, steel brokers, from 1881 to 1884, when he became associated as a special sales agent with Carnegie Brothers & Co., Ltd., of which he later became vice-chairman. Still later he served as vice-president and president of the Carnegie Steel Co. He was a member of the Duquesne Club, Union League Club, and other clubs in this and foreign countries. He is survived by two daughters and a son.



J. G. A. LEISHMAN

WILLIAM T. BRADBERRY, a pioneer stove manufacturer of Pittsburgh, died at his home in that city, March 28. He retired from active business in 1899, when the company in which he was interested, the Amshuetz-Bradberry Stove & Range Co., was merged with the Pittsburgh Stove & Range Co. He was born in Finleyville, Pa., in 1839, but removed with his parents to Pittsburgh in 1848 and made his home in that city thereafter. He served in the Civil War from 1862 until the end of the conflict. In 1870 he became superintendent of the old stove foundry of DeHaven & Co., and in 1879 became associated with Henry Amshuetz & Son, later becoming a member of the firm, the name of which was changed to Amshuetz-Bradberry & Co.

WILLIAM H. MAW, for 58 years editor of *Engineering*, London, England, died March 19 at Kensington. He was born Dec. 6, 1838, and was privately educated. After ten years in the designing and building of railroad rolling stock, he joined Zerah Colburn in establishing the paper which he conducted so long. Its first issue bore the date Jan. 5, 1866. During his later years he served as president of several of the leading British engineering institutions.

LOUIS PAPER, president Paper, Calmenson Co., wholesale dealers in old material, St. Paul, Minn., died March 6.

LUTHER G. TURNER, formerly president and general manager of the Turner & Seymour Mfg. Co., Torrington, Conn., died March 27 at Southern Pines, N. C. He was born in New London, Conn., 78 years ago, and had been associated with the company for 48 years. He was a director in several banking institutions. Mr. Turner was stricken with pneumonia while returning home, after a vacation in Florida with his family.

C. L. PRINCE, for 25 years associated with the General Electric Co. in iron foundry work at Schenectady and one of the pioneers in the American Foundrymen's Association, died in Schenectady, March 20, aged 67 years. Mr. Prince was born in Georgetown, Mass., and was graduated from the Worcester Polytechnical Institute. He went to Schenectady in 1899 as superintendent of the General Electric Co. foundry, having previously been employed by the Camden Iron Works, Camden, N. J. Later, his efforts were concentrated on expediting production and prior to his death he was following a specialized line of work.

HORACE M. BRACKEN, representative on the employees' committee of the Bethlehem Steel Co., Johnstown, Pa., during 1923, and recently elected to that office for 1924, died of heart disease March 22, aged 63 years. He had been elected secretary of the Bethlehem bargaining committee for the present year and was head of the mutual benefit association of the Bethlehem works at Johnstown.

JAMES R. STOTLER, purchasing agent of the Pittsburgh Meter Co., a subsidiary of the Westinghouse Electric & Mfg. Co., died March 27 from the effects of a recent operation. He was 46 years old.

JOHN J. EAGAN, who resigned recently as president of the American Cast Iron Pipe Co., Birmingham, Ala., died at Asheville, N. C., March 30. Failing health for several months gradually interfered with his usual activities until, as announced in THE IRON AGE of March 27, he withdrew from business. Mr. Eagan had been with the company since its inception and held all of its common stock. Upon his acceptance of the presidency in 1921 he declared his intention to pattern the policies of the company after the golden rule. Through his efforts a definite plan of profit sharing with employees has been pursued. Common shareholders for two years have received no returns from operations. All profits have been so distributed among employees as to increase all incomes to a scale, a minimum for which was set jointly by the board of operatives and the board of management.

WILLIAM B. SCAIFE, vice-president and general manager of William B. Scaife & Sons Co., Pittsburgh, died March 28, at Palm Beach, Fla. He was born in Allegheny, Nov. 9, 1871, and received his early education at public and private schools, attending Western University of Pennsylvania, now the University of Pittsburgh. Later he entered the class of 1892 at Cornell University. After leaving college he became connected with the Scaife company. He is survived by Mrs. Scaife, a sister, Mrs. John H. Ricketson, Jr., and a brother, J. Verner Scaife, president of William B. Scaife & Sons Co.

Plans of New Companies

The National Standard Horseshoe Co. has leased part of a three-story building at 56 Cherry Street, Akron, Ohio, and will manufacture horseshoes, continuing and enlarging an established business. Captain A. Stair is president.

The Kershner Mfg. & Sales Co., Inc., Norton, Kan., has been organized with $30,000 capital stock to manufacture a device for utilizing power of automobiles for commercial purposes. Operations are under way. John H. Kershner is president and treasurer, D. C. Kershner, director of sales, and L. Nixon, secretary.

The Aspinwall-Watson Co., Houlton, Me., has been organized with $100,000 capital stock, to manufacture agricultural equipment. Jason Hassell heads the company.

The Meyer Electric Mfg. Co., 2615 Canal Street, Houston, Tex., has been organized with capital stock of $10,000 to manufacture automatic time switches, electric clocks and other electrical devices. Equipment has been purchased. F. H. Meyer is secretary-treasurer.

The Marion Electric Corporation, Marion, Ind., organized with $25,000 capital stock, will continue to manufacture electric heating devices, formerly made by the Allmur Mfg. Co., organized in 1916. It uses about 20 tons of cold-rolled strips per month. R. R. Kimmel is general manager.

The Master Reverse Gear Corporation, Lockport, N. Y., has been incorporated to manufacture marine transmissions and reverse gears, having taken over a business established four years ago. W. B. Ellis is treasurer.

The Buffalo Furnace Supply Co., with office and warehouse at 541 Seneca Street, Buffalo, has been organized as distributor of furnace supplies.

The Charles H. Ingersoll Dollar Pen Co., 1 Clinton Street, Newark, N. J., has been organized with $250,000 capital stock, to manufacture pens. C. H. Ingersoll heads the company.

The Ideal Fuel & Appliance Corporation, Jamestown, N. Y., recently incorporated to manufacture stoves, ranges, etc., will distribute products manufactured by the Protane Corporation, Erie, Pa. W. A. Carter heads the company.

The American Seamless Tube Corporation, Woolworth Building, New York, has been organized with $400,000 capital stock, to manufacture seamless tubing. The vice-president of the company is now abroad and negotiations will be resumed upon his return. G. Zeller is assistant treasurer.

The Master Radio Co., Inc., 16 Journal Square, Jersey City, N. J., has been organized with nominal capital to manufacture radio products. All manufacturing will be done by contract. Lee Adams is sales manager.

The Richardson Boat Co., North Tonawanda, N. Y., has been organized with $50,000 capital stock to manufacture pleasure and commercial boats. It has plant and equipment. G. R. Richardson heads the company.

The Economy Grate & Equipment Co. has been incorporated with $300,000 capital stock, Delaware laws, to manufacture heating equipment. It is understood that the principals are identified with the Economy Grate & Equipment Co., 280 Madison Avenue, New York. Its plans are withheld temporarily. Gardner P. Lloyd, 50 Wall Street, New York, is representative.

Gretsch & Brenner, Inc., New York, have been incorporated with $200,000 capital stock to manufacture brass band instruments, etc. Walter Gretsch, 429 Clinton Avenue, Brooklyn, who heads the company, will be in Europe for about two months, and it is unlikely that plans will be developed until his return. Mr. Gretsch is connected with the New York Band Instrument Co., 111 East Fourteenth Street.

The Van-Le Corporation, 100 Sip Avenue, Jersey City, N. J., has been organized with capital stock of $100,000 to manufacture radio accessories. Part of its work has been let, but it will receive bids from woodworkers, machinists, etc. Millard Van Blaricom is president.

The Fogarty Excavating Appliances, Inc., 80 East Avenue, Rochester, N. Y., has been organized to manufacture digging buckets. Work for the present will be done by contract. Stanley Shepard is president.

The Hudson Harrow Co., Humboldt, Tenn., has been organized with $20,000 capital stock to manufacture side harrow attachments. Operations are under way. J. E. Warmath is president.

The Columbia Body Corporation has been organized to take over the property and machinery of the Columbia Wagon & Body Co., Columbia, Pa., net assets of which are estimated at $500,000. The new company will continue to make farm wagons, dump carts, etc., but will specialize in a line of commercial automobile bodies. Michael R. Hoffman, senior partner of the Hoffman Leaf Tobacco Co., Marietta, Pa., is sole owner and president.

The Quality Tools Corporation, New Wilmington, Pa., has been organized with $25,000 capital stock to manufacture pneumatic chisels, beading tools, rivet punches, etc., and will handle a complete line of mechanics' tools, some of which it will manufacture. Construction work has begun on a plant and the company is in the market for equipment. D. C. McChiston heads the company.

The Mechanical Supply Co., Inc., 30-32 Liberty Street, Battle Creek, Mich., has been incorporated with capital stock of $100,000, half of which has been paid in, to take over the assets of the Steel Age Mfg. & Supply Co. It will conduct a general mill supply and machinery business, but on a somewhat broader scale. E. D. Fitzpatrick, who was founder of the Steel Age company, will be president and manager, and Harry P. Dunning, formerly of the Edwards & Chamberlain Co., Kalamazoo, Mich., is vice-president and sales manager.

The Lucas Electrical Laboratories, Inc., 888 Pearl Street, Benton Harbor, Mich., has been organized with $10,000 capital stock to manufacture electrical equipment. Manufacturing for the present will be done by contract, awards already having been made.

The Hobbs Storage Battery Corporation, 2019 Bay Street, Los Angeles, Cal., has been organized with $500,000 capital stock to manufacture electric storage batteries and electric equipment for service stations. It has taken over the business and assets of a concern in full operation. C. G. Pyle is general manager.

A. C. E. Collinson Fence Co., 14 Shepard Terrace, West Orange, N. J., recently organized, will manufacture all types of iron and wire fencing. A factory has been erected and complete supplies of equipment and materials are on hand. J. B. Collinson heads the company.

Hambleton Bobbin Co., Lebanon, N. H., has been organized with $150,000 capital stock to manufacture bobbins and textile machinery, having acquired a business in full operation in this line. E. Hambleton is president.

The Bicknell-Thomas Co., Greenfield, Mass., is a reorganization of the company by that name with the following officers: Leon E. Turner, for the past few years connected with the Martin Machine Co., Turners Falls, Mass., as secretary and sales manager, is president and treasurer; Herbert M. Darling, formerly factory superintendent of the Bicknell company, but more recently conducting his own business in the manufacture of special tools and machinery, is secretary and engineer. The new organization will continue to manufacture tapping machines, reversing tapping attachments, chucks, releasing tap holders, thread lead indicators and special machinery.

The Christian Electrical Corporation, 1625 East Euclid Avenue, Detroit, recently organized with $100,000 capital stock, will manufacture electric water heating equipment. Operations are now under way. F. H. Christian is one of the principals.

The Etie Sheet Metal Works, Inc., 1510 Washington Avenue, Houston, Tex., has been organized with nominal capital to operate a sheet metal works. Remodeling of the present plant is being considered. W. R. Etie is president and general manager; D. Barker, vice-president, and W. O. Olsen, secretary-treasurer.

The Beil Brass & Aluminum Co., Inc., 724 East Twenty-second Street, Paterson, N. J., has been organized with $5,000 capital to manufacture brass, bronze, copper and aluminum castings and other metal products. It has capacity at present to manufacture about six tons of rough castings per week. Its plant may be enlarged later. G. A. Beil is president; F. C. Hindle, treasurer, and J. Emmerson, secretary.

The Weldon Sheet Metal Works, Weldon, N. C., has been organized to engage in a general sheet metal business and also in general sanitary engineering. It succeeds to a business organized for about ten years. T. A. Chappin is president.

The Toledo Shipbuilding Co., Toledo, Ohio, incorporated under Delaware laws with capital stock of $6,000,000, has taken over the business and assets of the Toledo Shipbuilding Co. of Maine. Business will continue as before under the same management. H. S. Wilkinson is president and treasurer.

The William Schofield Co., recently organized to manufacture machines and castings principally for the textile trade, is successor to a company established 20 years in this line. Address is in care of Porter, Foulkrod & McCullagh, 1106 Commonwealth Trust Building, Philadelphia.

The California Electric Service Co., 425 West Sixty-

second Street, Los Angeles, Cal., has been organized to take over the contracting business of C. M. H. Nelson, who has operated as electrical engineer. It will be in the market for supplies.

The S. J. Fitzsimons Co., Woodbridge and McDougall Avenue, Detroit, has been organized with capital stock of $100,000 to manufacture brass, steel, tubular specialties and stampings for automobile manufacturers. The company is in full operation. S. J. Fitzsimons is president.

The Guild Mfg. Corporation, 1295 Seventy-eighth Avenue, Oakland, Cal., has been incorporated with capital stock of $250,000, under Delaware laws to manufacture farm implements and equipment. The company will lease a building and do its own manufacturing. It will be in the market for materials. The company desires to get in touch with an Eastern concern interested in building a one-wheel harrow for distribution in the East. It will also manufacture a centrifugal pump later for farm irrigation. A. W. Guild is president.

Buffum Tools, Inc., has been organized to manufacture mechanics' tools, light forgings and truck forgings, succeeding the Buffum Tool Co., Louisiana, Mo. William G. Marqua is president and James F. Cablin, vice-president and general manager.

John F. Brady, Inc., has been organized to operate a general electric plating works at Friendship and Garnet Streets, Providence, R. I. It has taken over a business established 30 years. Joseph F. Brady heads the company.

The Wiseman Electric Co., Greenville, Miss., has been organized as dealer and contractor in electrical equipment.

The Ciccone Cast Stone Co., Inc., 316 Silver Spring Street, Providence, R. I., has been organized with $25,000 capital stock to manufacture concrete blocks and cast stone trimmings. A. Beretta is manager.

The Standard Radial Blast Corporation, 30 Church Street, New York, has been organized to manufacture radial type sand blast barrels, formerly made by the Standard Equipment Co., New Haven, Conn. Charles S. Johnson, formerly sales manager of the Standard Equipment Co., is general manager of the new company.

The Sanford Automotive Products Corporation, 522 Fifth Avenue, New York, has been incorporated with capital stock of $250,000 to manufacture farm lighting units. Its factory at Noah, Conn., is in production. The company has concluded arrangements with the New Britain Tool Co., New Britain, Conn., whereby the distribution of the products of both companies will be done in conjunction. The New Britain company manufactures tractors. F. T. Sanford heads the new company.

F. Maldari & Brothers, 127 Baxter Street, New York, recently incorporated with $25,000 capital stock to manufacture special machinery and parts, has installed equipment and is now in full operation. A. Maldari heads the company.

The Universal Rotary Flatbed Printing Press Co., Inc., 124-32 White Street, New York, has been incorporated with $500,000 capital stock, fully paid, to manufacture a printing press said to be capable of printing six colors. It will also build an automatic rock tunnelling machine with which A. Zwoboda, president of the company, bored rock for a section of the Lexington Avenue subway, New York. Final steps are being taken to perfect the details of the machine in the company's shop. If it proves entirely successful and quantity production is decided upon, a larger plant will be required. However, this will not be undertaken for several months. W. M. Fowler is vice-president.

The American Roll & Machine Co., Warren, Ohio, has been incorporated with $300,000 capital to manufacture rolls for steel plants. Plans have been developed for erection of a plant in Trumbull County, near Leavittsburg, three miles west of Warren. Among the incorporators are J. B. Estabrook and R. E. Shook.

A partnership to be known as Schupp & Mansfield has been formed by Valentine B. Schupp, former sales manager of the Sizer Steel Corporation, and E. A. Mansfield, former assistant sales manager of the Sizer corporation. The new firm which has offices in Ellicott Square, Buffalo, will sell the products of the Erie Forge Co., Erie, Pa., Hartford Tube Products Co., Hartford, Conn., Michigan Smelting & Refining Co., Detroit, and the Eureka Co., North East, Pa.

The Universal Pipe Threading Machine Co., Inc., 248 Monroe Avenue, Memphis, Tenn., has been incorporated with capital of $100,000 in preferred and 5000 shares of common stock, no par value, to manufacture portable power driven pipe threading devices, having acquired the business of the Universal Pipe Machine Co. It has not been decided whether manufacturing will be done directly or by contract. B. T. Hewitt heads the company.

The Paul H. Smith Hardware Co., 823 Main Street, Westbrook, Me., organized with $50,000 capital stock, has taken over the hardware business of Knight Brothers Co., a retail establishment. The latter company will remain in the heating and sheet metal lines.

The Gray Wire Specialty Co., 18515 Detroit Avenue, Cleveland, has been organized with $10,000 capital stock to manufacture wire specialties. The company has leased a plant and installed equipment and is now in operation. R. H. Gray is president.

W. M. McKee, Inc., Oliver Building, Pittsburgh, has opened an office for the sale of mechanical and electrical equipment and materials for mines, mills and industrial plants. It is exclusive agent for the following companies: The Ideal Electric & Mfg. Co., Mansfield, Ohio; K. W. Battery Co., Chicago; Humil Corporation, Port Chester, N. Y.

The New England Portland Cement & Lime Co., Rockland, Me., incorporated with capital stock of $500,000, will operate a cement mill and hydrate lime works. Adelburt L. Miles is president and Ada Barbour is treasurer.

The Liberty Oil Burner Co., care of F. Scognamillo, 2259 Bassford Avenue, New York, was recently organized with capital stock of $150,000 to manufacture oil-burning equipment. Present plans provide for the early construction of a building and the installation of equipment. The incorporators are F. Scognamillo and L. Camerino.

The Thomas Products Co., 1722 South Los Angeles Street, Los Angeles, Cal., has been incorporated with $100,000 capital stock to manufacture, distribute and install refrigerating machinery and parts, also insulating materials, resilient flooring materials, etc. Manufacturing will be done by contract for the present. Equipment may possibly be needed later. P. Edwin Thomas, formerly Cincinnati manager for Armstrong Cork & Insulation Co., is president and general manager. H. H. Wetzel, general manager of the Douglas Co., Santa Monica, Cal., builder of motor cruisers, is vice-president.

The Turner Mfg. Co., Kokomo, Ind., organized with $75,000 capital stock, has become successor to a partnership established four years ago. It will manufacture various automotive devices. The company is considering the construction of a small plant within six months and it will not need equipment prior to that time. E. W. Turner is president and general manager.

The Meco Products Corporation, 52 Vanderbilt Avenue, New York, has been organized to manufacture and sell time-controlled switch mechanisms. Contracts have been let for manufacturing parts and dies. H. Armour Smith is president; M. J. Maguth, vice-president; Ralph R. Mulligan, treasurer, and P. Frank Sonnek, secretary.

Trade Changes

The New York office of the Bury Compressor Co., builder of air and gas compressors, Erie, Pa., has been moved to 50 Church Street. H. L. Dean is in charge.

Freyn, Brassert & Co., engineers, now located at 122 South Michigan Avenue, Chicago, will move to the new Straus Building, 312 South Michigan Avenue, May 1. This company was organized in 1914, when it occupied 308 sq. ft. of office space. Its new quarters in the Straus Building will embrace 6099 sq. ft. During its life the firm has handled a total of 478 individual contracts for 158 different customers. It has built 11 new blast furnaces for nine companies and has remodeled 14 blast furnace stacks for 11 companies. It has taken contracts not only in the United States but also in Canada, France, Holland, Germany, Sweden, Australia, South Africa, China and Japan. The company is associated with Freyn, Brassert & Co., Lt., London, England, and Gutehoffnungshütte, Oberhausen, Rhineland, Germany. It maintains an Eastern office at 1315 Walnut Street, Philadelphia.

The Pittsburgh office of the Niles-Bement-Pond Co. and Pratt & Whitney Co., makers of machine tools, effective April 1, will be moved to 1115 Empire Building, 503 Liberty Avenue.

Pickands, Mather & Co. have moved their Cleveland offices from the Western Reserve Building to the Union Trust Building.

The Raymond Brothers Engineering Co., Chicago, designer of Rayco pulverized fuel systems and manufacturer of machinery and equipment for utilizing pulverized coal, has moved general sales office to the Combustion Engineering Corporation Building, 43 Broad Street, New York. H. D. Savage, vice-president and general manager of the Combustion Engineering Corporation, will be in charge of sales.

Machinery Markets and News of the Works

MACHINE-TOOL MARKET DULL

Inquiries Are Not Developing Into Orders in Satisfactory Volume

March Sales Better Than Those of February with Some Companies, But Average Shows Decline

March machine-tool business throughout the country was not satisfactory to the trade. Some sales offices did more business than in February, but this was not the general experience, the month as a whole showing a decline from February sales records. With plenty of inquiries, the trade at the beginning of the month looked forward to fairly substantial buying, but the spirit of hesitation, which has marked all lines of business, has had its effect on machine-tool buying.

The slowing up in the automobile industry has made quite a difference in the volume of tool buying at Detroit. A number of manufacturers of automobile parts have received cancellations. Orders for automobiles for spring delivery have not been up to expectations, and there are reported to be fairly large stocks on hand.

Railroad buying during the week has not been important. The American Locomotive Co., New York, is expected to place orders this week for a small list of tools. The Chicago, Milwaukee & St. Paul, having taken options on equipment needed for its shops, is awaiting appropriations before placing formal orders.

The Libby-Owens Sheet Glass Co., Toledo, Ohio, is placing orders for machinery for plant extensions, its requirements including nine tools. The Pittsburgh Plate Glass Co., Pittsburgh, has issued an inquiry for several tools.

The Board of Education, La Crosse, Wis., has asked for bids on an extensive list of metalworking and woodworking machines for school use.

New York

NEW YORK, April 1.

MACHINE-TOOL business has been very quiet the past week. The American Locomotive Co., New York, is in the market for a fair-sized list of tools and will probably place orders this week. More orders have come from the Canadian National Railways, among the machines bought being a 400-ton wheel press and a 5-ft. radial drill. The General Electric Co. has purchased a 24-ft. vertical boring and turning mill for its West Lynn, Mass., shops. The National Plate Glass Co., Ottawa, Ill., has bought a 36-in. x 12-ft. planer from an Eastern builder. The Cedar Rapids & Iowa City Railway Co. bought a 300-ton wheel press. Prospects are less encouraging. Used tools in good condition are frequently in better demand than new tools, a case in point being the auction sale of the equipment of the Fox Motor Co., Philadelphia, on March 25. The machines brought good prices and a majority of the bidders were manufacturers instead of dealers.

Bids will be received until April 9, by the Board of Water Commissioners of the Port Washington Water District, Port Washington, L. I., for equipment for a pumping station, including one fuel oil engine driven triplex pumping unit; one motor-driven dry vacuum pump; automatic controlled motor-driven centrifugal pump; steel water tank and tower; suction and discharge piping, etc. Nicholas S. Hill, Jr., 112 East Nineteenth Street, New York, is consulting engineer. Edward J. West, 186 Main Street, Port Washington, is secretary of the board.

Nathan Rotholz, 311 Lenox Avenue, New York, architect, has plans for a two-story automobile service and repair building on Marion Avenue, 82 x 205 ft., to cost approximately $100,000 with equipment.

The Logan Construction Co., 13 Park Row, New York, contractor, plans to purchase a pipe-threading machine, about 8 in.

Electric motors, power equipment, conveying and other machinery will be installed in the eight-story plant to be erected on Berry Street by the David Wells Son Lithographing Co., 386 Berry Street, New York, to cost approximately $725,000, for which a general contract has been awarded to the Commonwealth Engineering Corporation, 103 Park Avenue.

Dr. Julio Brouwer, Mazon H. Altos, Havana, Cuba, is inquiring for small grinding machines, suitable for laboratory use.

The Bureau of Foreign and Domestic Commerce, Washington, has information regarding the first of the proposed group of three iron and steel plants to be constructed by the Government of Brazil, Rio de Janeiro, in accordance with an executive decree made in January, on which work will soon begin, Reference No. 122,216.

Edward A. Mathews, clerk of the Town Board of Eastchester, Tuckahoe, N. Y., will receive bids until April 9 for equipment for an incinerator plant, brick stack, etc., on the White Plains Road, Eastchester. J. F. Musselman, 101 Park Avenue, New York, is consulting engineer.

The Baltimore & Ohio Railroad Co., 2 Wall Street, New York, will begin the electrification of its lines on Staten Island, with first section, including equipment, estimated to cost $7,000,000. The entire work will involve approximately $15,000,000, totaling about 17 miles.

The Hammond Typewriter Co., 305 Broadway, New York, has leased the building at 500 East 133d Street, for a local plant. The company recently disposed of its former works at 537 East Sixty-ninth Street, and will remove to the new location.

The Adirondack Power & Light Corporation, Schenectady, N. Y., is disposing of a bond issue of $1,150,000, a portion of the proceeds to be used for additions to power plants and system.

The Shipley Construction & Supply Co., 201-3 Forty-second Street, Brooklyn, manufacturer of ice-making machinery, etc., has filed plans for a one-story addition, to cost $10,000 exclusive of equipment.

The Associated Utilities Co., 30 Church Street, New York, will soon take bids for an eight-story ice-manufacturing and cold storage plant, 105 x 165 ft., at 56 Center Street, Newark, N. J., to cost $1,000,000 with equipment. John Decker, 19 Ridgeview Avenue, West Orange, N. J., is architect.

The D. & P. Roofing Tile Co., 44 Polk Street, Guttenberg, N. J., is taking bids for its proposed plant on Twenty-eighth Street, North Bergen, N. J., one-story, 30 x 100 ft., for the manufacture of cement roofing tile, etc. George Willaredt, 411 West Twenty-third Street, West New York, N. J., is architect.

The Union County Buick Co., 333 North Broad Street, Elizabeth, N. J., is taking bids for a two-story service and repair building 42 x 100 ft., to cost approximately $45,000. Harold D. Brady, company address, is architect.

Work has begun on a two-story addition to the Essex County Vocational School for Boys, 229 Valley Road, West Orange, N. J., 26 x 70 ft.

Ovens, power equipment, conveying and other machinery will be installed in the seven-story chocolate and confectionery plant, 100 x 240 ft., to be erected by Henry Maillard, 368 Fifth Avenue, New York, at Long Island City.

estimated to cost $750,000. Buchman & Kahn, 49 West Forty-fifth Street, are architects.

The A. P. Smith Mfg. Co., East Orange, N. J., is inquiring for a slab type milling machine, 2 vertical and 1 side head, table about 12 ft. long, distance between housing and under rail about 42 in.

F. H. Crawford & Co., 299 Broadway, New York, is in the market for a No. 3 Coulter and McKinzie taper rolling machine or equivalent.

M. Kamenstein, 135 Pearl Street, Brooklyn, is inquiring for a No. 4 toggle or cam press.

John McWilliams & Sons, Jersey City, N. J., are in the market for a locomotive type boiler, 150 hp. and 150 lb. pressure.

The Ornamental Iron & Wire Works, 72 Warren Street, Newark, N. J., has been formed to operate a general wire and iron works. It has leased a plant at 14 Fleming Avenue and is in the market for 3 punch presses, 2 cutting machines, 31 crimping machines and 1 drill press. Joseph Mills and Harold W. Ford are the principals.

Philadelphia

PHILADELPHIA, March 31.

BIDS are being received by the Bureau of Water, City Hall, Philadelphia, until April 16, for the erection of a power house at the Northeast sewerage disposal works, Wheatsheaf Lane.

The Carlisle & Doughty Co., 2530 Broad Street, Philadelphia, manufacturer of electric storage batteries and equipment, plans the immediate rebuilding of the portion of its plant destroyed by fire March 28, with loss reported at $50,000 including equipment. The company recently awarded a general contract to Henry P. Schneider, 3713 York Road, for improvements to cost $20,000.

The Globe Metal Mfg. Co., 2122 East Hazzard Street, Philadelphia, has plans in preparation for a new three-story and basement factory, 35 x 110 ft., at 2620-22 Martha Street. H. H. Kline, Bulletin Building, is architect.

Fire, March 25, destroyed a portion of the brass foundry of the J. E. Lonergan Co., 211 Race Street, Philadelphia, manufacturer of steam specialties, etc., with loss estimated at $25,000. It is planned to rebuild.

The Philadelphia Lumber Exchange, Crozier Building; Pennsylvania Lumbermen's Association, Otis Building; and the Wholesale Lumber Association of Philadelphia, are perfecting plans for the construction of a lumber terminal and mill works on Oregon Avenue, including Pier 98, totaling 88 acres. The project will involve several large lumber mills, machine shops, power house and several electric traveling cranes. It is estimated to cost $25,000,000 complete, and will be carried out jointly by the organizations noted. Wilson H. Lear, president of the Lumber Exchange, is chairman of the committee in charge.

The Foreign Trade Bureau, Chamber of Commerce, Twelfth and Walnut Streets, Philadelphia, has an inquiry from a company in Switzerland in the market for saws, files, tools and kindred products.

The United States Chain & Forging Co., York, Pa., has plans under way for an addition to its plant, estimated to cost $35,000.

The Philadelphia & Reading Coal & Iron Co., Reading Terminal, Philadelphia, is planning for the installation of equipment, including hoisting and conveying machinery, on its properties near Shamokin, Pa., soon to be opened up for operations. The tract is estimated to contain 10,000,000 tons of coal.

Frank Leiphart, Wrightsville, Pa., operating a cement block manufacturing plant on the Lincoln Highway, has acquired 5 acres near the foundry of the Haldeman Brass Co., for a new plant, on which work will soon begin.

The Harrisburg Light & Power Co., Harrisburg, Pa., is disposing of a bond issue of $1,000,000, a portion of the proceeds to be used for extensions in electric power plant and system, with additional equipment.

The Nuss Brothers Mfg. Co., Harrisburg, Pa., manufacturer of automobile wheels, has leased a building now being constructed between Forster and Seventh Streets, totaling about 12,000 sq. ft. of floor space, for a new plant.

The Kresge Coal Co., Pittston, Pa., plans the installation of electric power equipment and mining machinery for the development of anthracite coal properties near Silverton, Schuylkill County, estimated to cost $80,000.

The Air Reduction Co., Inc., 342 Madison Avenue, New York, manufacturer of industrial oxygen, etc., is taking bids on a general contract for its proposed plant at Harrisburg, Pa., totaling 25,000 sq. ft. of floor space, estimated to cost $250,000 with equipment. Francisco & Jacobus, 511 Fifth Avenue, New York, are architects and engineers.

The Board of Education, Abington, Pa., is taking bids on a general contract for the erection of a manual arts building and power house at the local high school. Heacock & Hokanson, 1218 Chestnut Street, Philadelphia, are architects.

The Cranberry Creek Coal Co., Hazleton, Pa., is planning the installation of electric power equipment and mining machinery, including electric-operated shovels, conveying machinery, etc., at Crystal Ridge, near Hazleton.

The Chantrell Hardware & Tool Co., Reading, Pa., has superstructure work under way on its three-story addition, 50 x 140 ft., estimated to cost $55,000.

N. E. Martin, Leola, Pa., is in the market for a carload of used, damaged or untested pipe, 5 to 10 in. in diameter.

Manual training and vocational equipment will be installed in the new school to be erected at Bridgeville, Pa., estimated to cost $70,000 for which the school trustees are in charge.

St. Louis

ST. LOUIS, March 31.

THE machine tool business in St. Louis is extremely dull; in fact, there is less buying now than at any time since 1920. Railroads centering in St. Louis are not in the market, and state they will not buy any tools during 1924. The only encouraging situation is the report that they are planning to buy early in 1925.

The Missouri Boiler Works, 923 North Third Street, Kansas City, Kan., Harry Darby, head, has acquired about 25 acres in the Fairfax Drainage District, and plans the construction of new boiler and plate works, estimated to cost $80,000 including equipment.

The Imes-Schilling Sash & Door Co., 2016 Papin Street, St. Louis, has awarded a general contract to William Cunliff, 4935 Delmar Boulevard, for the erection of a new plant two and three-stories, 102 x 225 ft., estimated to cost $200,000 with machinery.

The Boether Co., Denver, Colo., operating cement mills, has preliminary plans for new works near Tulsa, Okla., estimated to cost $2,000,000, complete. A power house will be constructed, with waste heat boilers and two 3000 kw. generating units. Two electric shovels will be installed, with gyratory rock crushers, hammer mills, quarrying machinery and miscellaneous equipment. C. D. Nichols and M. O. Matthews, Tulsa, are local representatives.

The Kansas City Can & Mfg. Co., Fourth and State Streets, Kansas City, Kan., is completing plans for a new plant in the Fairfax Drainage District, to cost about $75,000. It is expected to call for bids in April. C. A. Patterson, Fourth and State Streets, heads the company. Horner & Wyatt, McMillen Building, are engineers.

The Prairie Oil & Gas Co., Independence, Kan., has tentative plans for the construction of a new oil refinery on neighboring site, to cost $200,000 with machinery.

The Breslin Boiler & Iron Works, Fort Smith, Ark., is in the market for a power brake capable of bending No. 12 to ¼ in. plates.

The Wood & Lane Co., 915 Olive Street, St. Louis, machinery dealer, has inquiries out for one 150 kva. electric generator set, 2300 volts, three phase, 60 cycle, direct-connected to uniflow or simple Corliss engine, complete with accessory apparatus, switchboard, etc.

The Fairfax Iron & Steel Co., Kansas City, Kan., recently organized, has engaged Horner & Wyatt, McMillen Building, architects, to prepare plans for new works in the Fairfax Drainage District. It will be one-story, 150 x 700 ft., for the production of steel, gray iron and malleable castings.

The Missouri Portland Cement Co., Post-Dispatch Building, St. Louis, is reported to be planning for extensions in its mills. The company recently arranged for an increase in capital to $5,950,000, to provide in part for the expansion.

The Robinson-Packer Co., Eldorado, Kan., manufacturer of oil well machinery and parts, has acquired a building at Blackwell, Okla., which will be remodeled for a new plant.

The East Missouri Power Co., Troy, Mo., has acquired the local municipal electric station of the Department of Public Works, and will take immediate possession. The company plans to make this its main generating plant, and will install considerabe additional equipment.

The Common Council, Cushing, Okla., plans the installa-

The Crane Market

The market on both electric overhead and locomotive cranes is quiet. A fair volume of inquiry is pending and further inquiries are apparently in prospect for contemplated construction. The Foundation Co., 120 Broadway, New York, which has a contract with the Southern Railway, Washington, D. C., for construction of a Freight Classification yard at Knoxville, is reported to have been receiving a few estimates on the cost of crane installations, but a formal inquiry has not been issued. The General Electric Co., has purchased a 15-ton, 21-ft. span overhead crane for Schenectady, N. Y., and is reported to have closed on at least part of the cranes for Pittsfield, Mass., which included two of 100-tons and two of 10-tons capacity. The Supply Officer, Navy Department, Portsmouth, N. H., is taking bids for three trolley chain hoists.

In the Pittsburgh district, the Pittsburgh Plate Glass Co. has placed a couple of overhead cranes with the Alliance Machine Co. and the Wheeling Steel Corporation has placed a soaking pit crane with the same maker. Inquiry has been fairly active with new requests coming from the Carnegie Steel Co., for its Homestead, Duquesne and Edgar Thomson works, while formal inquiry for four cranes for the new bar mill of the Jones & Laughlin Steel Corporation at Woodlawn, Pa., is expected in a few days. Action on the 12 cranes for the Westinghouse Electric & Mfg. Co., for installation at Sharon, Pa. (Stone & Webster, Boston, contractors), is not expected for at least two weeks as the company has made a change in the speed requirements. It is understood that the papers in connection with the 19 cranes for the Gary works of the National Tube Co., have gone to New York for final approval.

In the Chicago district the Great Northern Railroad is inquiring for a 30-ton locomotive crane; the Elgin, Joliet & Eastern Railroad for an electric hoist; and the La Crosse, Wis., Board of Education for a triple-geared overhead, 12-wheel hoist and a Canton No. 3 portable low bed hoist.

Among recent purchases are:

Tonopah Extension Mining Co., 30 Church Street, New York, a 15-ton overhead traveling crane for Tonopah, Nev., from the Pawling & Harnischfeger Co.

Hoyt Metal Co., Granite City, Ill., a 5-ton, 46-ft. 6-in. span overhead crane, from the Shepard Electric Crane & Hoist Co.

Vermont Marble Co., Proctor, Vt., a 5-ton and a 2-ton electric traveling crane, from the Shaw Electric Crane Co.

McClintic-Marshall Co., Pittsburgh, a 10-ton, 106-ft. span overhead traveling crane for Pottstown, Pa., from the Shaw Electric Crane Co.

Milwaukee Structural Steel Co., Milwaukee, Wis., two 5-ton and one 3-ton electric hoist from the Shepard Electric Crane & Hoist Co.

Jobson-Gifford Co., New York, a 40-ton, 80-ft. boom, used Industrial locomotive crane from Philip T. King, New York.

Cuban-American Sugar Co., 129 Front Street, New York, a 16-ton tandem hand power trolley for export to Cuba, from the Chisholm-Moore Mfg. Co.

Inspiration Consolidated Copper Co., 25 Broadway, New York, a 5-ton hand power hoist and a 2-ton hand power trolley for use in Arizona, from the Chisholm-Moore Mfg. Co.

Kropp Forge Co., Chicago, a 10-ton, 30-ft. span overhead traveling crane, from the Whiting Corporation.

Detroit Terminal Railroad Co., Detroit, a 200-ton locomotive hoist, from the Whiting Corporation.

Heilman Boiler Co., Allentown, Pa., a 2-ton, 30-ft. span single I beam hand power crane, from the Whiting Corporation.

Central of Georgia Railroad, a 5-ton, 25-ft. radius jib crane, from the Whiting Corporation.

Clark Equipment Co., Buchana, Mich., a 2½-ton, 30-ft. span hand power crane, from the Whiting Corporation.

Atchison, Topeka & Santa Fe Railroad, one 15-ton electric traveling crane for San Bernardino, Cal., shops, from the Shaw Electric Crane Co.

City of Chicago, a 6-ton electric trolley, from the Whiting Corporation.

Illinois Car & Mfg. Co., Chicago Heights, Ill., a 5-ton electric traveling crane, from the Whiting Corporation.

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tion of electric-operated pumping machinery in connection with extensions and improvements in the municipal waterworks, estimated to cost $505,000. Bonds have been voted.

Buffalo

BUFFALO, March 31.

MACHINE-TOOL business during March has been fairly good, and while bookings mostly involved used machines, enough orders were placed to reflect considerable activity. The Pierce-Arrow Motor Car Co. bought multiple-spindle drills and planer-type milling machines for the manufacture of a new, moderate-priced car to be placed on the market this summer. The Merritt Mfg. Co., Lockport, bought a new 42-in. planer, and Pratt & Letchworth purchased a board drop hammer..

The Board of Education, Buffalo, has authorized the installation of manual training equipment in school No. 32, Clinton and Cedar Streets. Part of the spring program includes seven new grammar schools, each of which will require about $10,000 worth of manual training equipment. D. J. Sweeney, deputy superintendent and business manager of the board, Telephone Building, Buffalo, will have charge of equipment purchases, except shafting and electrical connections which will be in charge of the respective architects. Frank A. Spangenberg, 250 Delaware Avenue, is architect for the new Seneca vocational school, but in this and the new Peckham vocational school to be built equipment from the old buildings will be used.

The Anderson Co., Randolph, N. Y., manufacturer of milking machines, is in the market for considerable new equipment to replace that destroyed by fire March 26.

The Palmeter Tool Co., Jamestown, N. Y., has secured an option on property at Salamanca, N. Y., and plans the erection of new works, for which considerable equipment will be required.

The Fuel Oil Burning Corporation, 504 Lafayette Building, Buffalo, has been organized to manufacture oil-burning equipment. Manufacturing will be done by contract. The company will be in the market for castings and 100-gal. tanks. No awards have been let as yet. J. B. Porter heads the company.

The Carborundum Co., Nigara Falls, N. Y., is inquiring for a used hydraulic press, with ram 20 to 26 in., pressure of 4500 to 6000 lb., stroke 18 in. platens 36 in. square or larger.

Plans have been filed by the Buffalo General Electric Co., Buffalo, for the erection of a power house at 25 Short Street, to cost $80,000. Work will also begin on an addition to the power substation at 854 East Ferry Street.

The Service Engineering Co., 211 State Street, Binghamton, N. Y., is planning to purchase a motor-driven bench lathe.

The Cataract-Sharpe Mfg. Co., Buffalo, manufacturer of wire frame lamp shades, etc., is contemplating a new one-story factory, 40 x 100 ft., at 230-38 Winchester Avenue, where site, 120 x 151 ft., has been secured. A. H. Sharpe is president.

The Common Council, Medina, N. Y., is considering the installation of electric-operated pumping equipment in connection with proposed extensions in the municipal waterworks, to cost $50,000. Bonds have been voted. G. H. Pettis is clerk.

The American Woodworking Machinery Co., 591 Lyell Avenue, Rochester, N. Y., will soon take bids for a three-story addition, 60 x 100 ft., to cost $42,000. John F. Ancona, Cutler Building, is architect.

The Consolidated Brick Co., Horseheads, near Elmira, N. Y., is perfecting plans and awarding general contracts for the erection of a new plant and power house to replace the works destroyed by fire a few months ago, with loss of $200,000 with equipment. The new plant will cost approximately a like amount.

The New York Central Electric Corporation, Hornell, N. Y., manufacturer of electrical equipment, is planning the construction of a new four-story plant to cost approximately $165,000 with equipment.

The Victor Box & Mill Co., 32 Leslie Street, Buffalo, has plans for a one-story factory, 200 x 300 ft., at Sumner, Brinkman and West Shore Avenues, to cost $75,000. The

machinery will be electrically-operated. Edward Zein is head.

William F. Schwartz, commissioner of public works, Room 5, Municipal Building, Buffalo, will take alternate bids until April 8 for one tire setting machine, adapted to wheels from 5 to 2½ ft. in diameter, and to set tires 1 x 4 in., and all lighter sizes. Bids will also be received until April 21 for iron pipe laterals and manifolds for the municipal filter plant at the office of George C. Andrews, engineer, filtration division, Bureau of Water.

The Peoples' Gas & Electric Co., 70 East First Street, Oswego, N. Y., has preliminary plans for an addition to its electric plant to cost approximately $185,000. R. F. Burnett is general manager.

Pittsburgh

PITTSBURGH, March 31.

MOST machine tool firms have found the past month better in point of sales than was expected. It has been made up largely of single tool orders, but the aggregate was good. Inquiries during the month have been numerous and include a few good-sized lists, notably those of the Youngstown Sheet & Tube Co. for Indiana Harbor, and the Carnegie Steel Co., for its new machine shop at Homestead, Pa. The opening of the second quarter of the year finds sentiment more cheerful. There seems to be little doubt about early action on the tools for Indiana Harbor and Homestead and there is also a possibility that the National Tube Co. soon will begin buying against its list for the new Gary tube works and that appropriations will be available for the tool purchases of the Sharon transformer plant of the Westinghouse Electric & Mfg. Co. Another prospect which is being closely watched is the Westinghouse Air Brake Co., which is making ready for a start on a new machine shop and foundry at Wilmerding, Pa.

In rolling mill equipment, the new bar mill for the Jones & Laughlin Steel Corporation, is the most important. Electrical equipment for this mill already has been awarded to the General Electric Co., and involves an expenditure of close to $1,000,000.

The Pneumatic Machinery Co., 507 Liberty Avenue, Pittsburgh, is in the market for air compressors.

The Staff Auto Brake & Mfg. Co., 957 Liberty Street, Pittsburgh, has been organized with $20,000 capital stock to manufacture a patented four wheel brake for Ford cars, together with other equipment. A building location is being sought in Pittsburgh and as soon as one can be had construction work will be started on a factory. In the meantime the company is preparing for immediate production. It will be in the market for equipment. Thus far no contracts have been made. M. Van Ullem is secretary.

The Westinghouse Electric & Mfg. Co., East Pittsburgh, has awarded contract to Stone & Webster, Inc., Boston, for two one-story steel frame shop buildings, a four-story reinforced concrete factory and extensions to the power house for its Sharon, Pa., works.

The Keystone Mfg. Co., Altoona, Pa., has acquired a plant on Silver Street, Sharon, Pa., for the manufacture of railroad accessories. Considerable machinery and equipment will be purchased. H. B. Kroft heads the company.

Fire, March 22, destroyed the plant and equipment of the Keystone Machine & Equipment Co., Oil City, Pa., with a loss of over $200,000 to equipment. No rebuilding plans have been announced.

A bond issue of $10,000,000 is being sold by the Duquesne Light Co., 435 Sixth Avenue, Pittsburgh, practically the entire proceeds to be used for extensions and improvements. Plans are under way for the construction of three automatic power stations, to cost $3,500,000 with equipment. A. W. Thompson is president.

The Glen Coal & Clay Products Co., Kesery, Elk County, Pa., has preliminary plans for the erection of a plant to manufacture tile products on a 250-acre tract, to include a power house. It will cost $90,000 with machinery.

Harry Ruben, Pittsburgh, care of Richard Irvin & Co., Ferguson Building, architects, is having plans prepared for a two-story automobile service and repair building, 50 x 125 ft., estimated to cost $75,000 with equipment.

The Wilbur Fuel Co., Clarksburg, W. Va., recently reorganized, with increase in capital from $500,000 to $1,000,000, has acquired coal properties near Lost Creek, W. Va., and plans for extensive development and the installation of additional electric power and mining machinery. D. J. Carter is president, and R. D. Lloyd, general manager.

The Superior Steel Co., Beaver Falls, Pa., recently formed with a capital of $100,000, has acquired property at Monaca, Pa., and contemplates the early construction of a new plant to cost approximately $75,000. M. P. Simpson, New Brighton, Pa., is president; William Elmes, vice-president, and Homer H. Swaney, Berver Falls, treasurer.

The E. H. Murford Co., Charleston, W. Va., has inquiries out for a 100 hp. engine, slide valve type, steam pressure from 100 to 150 lb.

The City Council, Martinsburg, W. Va., plans the installation of electric-operated pumping machinery at the proposed pumping station in connection with extensions in the municipal waterworks, estimated to cost $100,000.

A new company has been organized by former United States Senator Howard Sutherland, Elkins, W. Va., and associates, under the name of the Valley Supply Co., capitalized at $200,000, to establish a plant for the manufacture of automobile equipment and accessories. Vernon B. Harris and W. N. Fitzwater, both of Elkins, are also interested in the company.

The Montgomery Utilities Co., Charleston, W. Va., George M. Eckley, representative, has tentative plans for the construction of an electric light and power plant at Pratt, W. Va., to cost $85,000.

The Dawley Motor Co., Charleston, W. Va., has plans for a two-story service and repair building, 60 x 300 ft., estimated to cost $75,000. Noyes R. Dawley is head.

Chicago

CHICAGO, March 31.

THE month closes with the machine tool market much less active than when it started. Fresh inquiries are fewer and those which have been pending, in many instances, have been withdrawn. In the opinion of the trade, caution on the part of the buyer is ascribable both to the Washington investigation and to a slowing down in the automobile industry. A number of manufacturers of automobile parts have received cancellations. On the other hand, liberal orders are looked for from local steel mills and business is expected to result from pending railroad inquiries. It is understood that the Chicago, Milwaukee & St. Paul has taken options on equipment included in its recent list, but will not be able to close the orders until appropriations are forthcoming. Most of the equipment, however, which this road proposes to buy will consist of used machinery.

The Elgin, Joliet & Eastern has issued inquiries for two motor-driven grinders, a 24-in. upright drill, an angle bender and an angle shear. The Board of Education, La Crosse, Wis., has issued extensive lists of metal-working and wood-working machinery. The American Bridge Co. has entered the market for a 16-in. back-geared engine lathe, 6 ft. between centers, for delivery at St. Louis. The Pullman Co. has placed an order for a 2-in. Acme forging machine.

La Crosse, Wis., Public Schools.
Metalworking Machinery

Four 11-in. x 4-ft. quick change gear engine lathes.
Two 13-in. x 6-ft. plain engine lathes.
One 13-in. x 6-ft. quick change gear engine lathe with taper attachment.
One 16 to 24-in. x 8-ft. quick change gear engine lathe with gap bed and bridge and with taper attachment.
One 14-in. shaper (not back geared).
One No. 1 Kempsmith, or equivalent, universal milling machine.
One 6 x 6-in. Racine, or equivalent, power hack saw.
One No. 190 Wells, or equivalent, universal grinding machine.
Two 24-in. upright drilling machines.
One No. 847 Buffalo electric forge, 32 x 45 in., with coal box and tank, arranged for 110-volt, 60-cycle, three-phase current.
One No. 8203 Black Diamond Saw & Machine Works saw filing and setting machine.
One ½-in. portable electric drill.

Woodworking Machinery

One 24-in. motor-driven planer similar to No. 2 Fay & Egan single cylinder surface planing machine.

One 6-in. motor-driven bench jointer, type Fay & Egan No. 502 bench hand planing and jointing machine.
One variety motor-driven saw bench, Tannewitz Type F.
One motor-driven No. 585 Oliver variety oilstone tool grinder.
One 8-in. motor-driven hand plane and jointer.
One No. 193-A Oliver, or equivalent, motor-driven saw bench on stand.
One No. 192 Oliver, or equivalent, motor-driven band saw.
One motor-driven hollow chisel mortiser similar to Brackett.
One No. 560 Oliver, or equivalent, motor-driven speed lathe.
One motor-driven belt sanding machine with 8-ft. table, 32 in. wide.
One 24-in. x 6-ft. single surface shaftless motor-driven planer.
One 12-in. ball-bearing hand planer and jointer.
One motor-head 12-in. x 8-ft. speed lathe.

The Whiting Corporation, Harvey, Ill., has received an order for a No. 5 cupola from the Buckeye Foundry, Cincinnati, and a contract for the iron work for one car-type and three drawer-type core ovens for the Hay Foundry & Iron Co., Newark, N. J.

The Dicke Tool Co., 73 Belmont Street, Downers Grove, Ill., is having plans prepared for a one-story addition, 84 x 127 ft., to cost $30,000.

The Chicago Macaroni Co., 2148 Canalport Avenue, Chicago, is taking bids on a three-story addition, 73 x 130 ft., and a one-story addition, 47 x 78 ft., to cost $75,000.

The Dreis & Krump Mfg. Co., 2920 South Halsted Street, Chicago, manufacturer of bending rolls, brakes and other equipment, has awarded contract for a two-story plant, 97 x 261 ft., 7400-50 Loomis Street, to cost $125,000.

C. H. Harb, formerly with the Michigan Brass & Iron Works, Lansing, Mich., has organized the Superior Brass & Aluminum Casting Co., at 811 Jerome Street, and will specialize in the manufacture of non-ferrous castings.

The Headford Brothers & Hitchins Foundry Co., Waterloo, Iowa, will reopen its large foundry at Beck and Vaughan Street, which was shut down following the industrial depression in 1921. For the past three years the company has operated only its smaller plant at 1502 Westfield Avenue, which will now be used for warehouse purposes.

The Buss Metal Window Co., 2736 Nicollet Avenue, Minneapolis, has been organized with $150,000 capital stock to manufacture metal sash and like products. Manufacturing for the present is being done by contract, but the company plans the early construction of a building and will be in the market for materials and equipment. B. M. Buss heads the company.

The Modern Die & Plate Press Co., Belleville, Ill., is in the market for a 36 or 42-in. Bullard vertical lathe and equipment.

Alexander T. McLeod, 820 First National Bank Building, Chicago, has inquiries out for a heavy lathe, suitable for turning stone, about 14 ft. between centers.

The Roseland Storage Battery Co., 11402 South Michigan Avenue, Chicago, has preliminary plans for a new two-story and basement factory, estimated to cost $60,000.

The Domestic and Foreign Commerce Department, Chicago Association of Commerce, 10 South La Salle Street, has received an inquiry from a company at Shanghai, China, in the market for excavating machinery, No. 2812.

The Nebraska Power Co., Omaha, Neb., will begin excavations for a new automatic power substation at Forty-third and Leavenworth Streets, estimated to cost $500,000. The project will be carried out in connection with an expansion program to involve approximately $3,000,000, including power plant enlargements and transmission line extensions. J. E. Davidson is general manager.

The Common Council, Alexandria, Minn., has authorized plans for the construction of a municipal electric power house to cost $40,000. Plans will be drawn and bids asked by the C. L. Pillsbury Co., 1200 Second Avenue, South, Minneapolis, Minn., architect and engineer. H. S. Campbell is city clerk.

Manual training equipment will be installed in the two-story and basement high school to be erected at Columbus, Neb., estimated to cost $300,000, for which bids will be asked on a general contract in May. Fiske & Meginnis, Bankers' Life Building, Lincoln, Neb., are architects.

The Common Council, Blair, Neb., will soon take bids for a new oil-operated engine and auxiliary equipment, for installation at the municipal power plant, estimated to cost $25,000. C. E. Krause is city clerk.

The Schuler Electric Co., Woonsocket, S. D., is having plans prepared for a one-story, steam-operated electric power plant. The McGraw Co., 515 Fifth Street, Sioux City, Iowa, is engineer.

New England

BOSTON, March 31.

MACHINE tool dealers see some improvement in the situation based on new inquiries. Current orders, however, are, with possibly two or three exceptions unimportant. The sale of a 20-ft. boring mill to a Greater Boston company, which has been under negotiation for a year, is the outstanding transaction in the past week. The Bangor & Aroostook Railroad purchased a 36-in. planer and another tool. Practically all New England railroads have bought some equipment this year, but have not begun to cover their requirements.

Additional sales, mostly used tools, include a 36-in. upright drill, two small presses, a 14-in. Hendey lathe, a Brown & Sharpe surface grinder, and a No. 1½ universal miller. Two or three production machinery inquiries from western Massachusetts are expected to close before the end of the week, and other single and small lots of production equipment also probably will be bought very soon, as well as a crane. Generally, orders come hard and only after weeks of work on the part of sellers.

In spots New England machine tool builders appear slightly more active, but collectively there is little if any improvement. Certain types of boring machines apparently are finding favor in railroad and large manufacturing shops. Manufacturers report live inquiries from the South, Middle West and Canada. Broaching machines, in excellent demand three or four months ago, are less active. Makers of lathes report a steady tapering off of plant operations.

The demand for small tools and machine parts, on the other hand, remains excellent. Sales for March in this territory probably will exceed those of February and January.

Bids have been extended until Saturday by the General Electric Co., Pittsfield, Mass., for plant extensions, for which miscellaneous equipment is required.

A permit has been granted the Consolidated Gas Co., Boston, for a two-story and basement manufacturing plant in Everett, Mass. It is part of a general revamping of the company's coke handling methods.

Permit has been given the F. P. Lyons Iron Works, Inc., Manchester, N. H., to erect a manufacturing plant to cost about $16,000.

Theodore A. Glynn, commissioner, 60 Bristol Street, Boston, has awarded a contract for a one-story 100 x 125 ft. fire alarm station on Westland Avenue and Hemingway Street, Boston to cost $500,000.

Plans are in progress for one- and two-story offices, garages and machine shops to cost $100,000 by the city of Lawrence, Mass. Walter T. Rochefort is mayor. J. Broadhurst, 45 Broadway, Lawrence, is the architect.

The Smith Carriage Co., 2 Park Street, Springfield, Mass., manufacturer of automobile bodies, carriages, etc., has awarded a general contract to the E. F. Carlson Co., 244 Main Street, for a four-story and basement plant 100 x 157 ft., estimated to cost $150,000 with equipment. H. C. Hearne, 387 Main Street, is architect. Norman H. Fowler is president.

The Bellamose Corporation, Hartford, Conn., will install a 1000 hp. steam-operated electric power plant at its new artificial silk manufacturing plant, now in course of erection at Rocky Hill to cost in excess of $200,000.

The Standard Sanitary Mfg. Co., Bessemer Building, Pittsburgh, has plans under way for a six-story factory branch, 80 x 200 ft., for storage and distributing service, on C Street, Boston, to cost $150,000 with equipment. French & Hubbard, 210 South Street, Boston, are architects and engineers. Local offices are at 186 Devonshire Street.

The Oxford Paper Co., Rumford Falls, Me., has plans for addition to its local mill, estimated to cost $150,000.

Garret O'Riordan, 5 Chelsea Street, Charlestown, Mass., is taking bids on a general contract for a one-story and basement automobile service and repair building, 185 x 257 ft., at 161 Harvard Street, Brookline, Mass., estimated to cost $110,000 with equipment. H. F. Bryant, 234 Washington Street, Brookline, is architect.

Bids will be received by the Bureau of Supplies and

Accounts, Navy Department, Washington, until April 8 for 2930 ft. steel cable, for the Boston Navy Yard, schedule 2024.

The Richmond Radiator Co., Norwich, Conn., manufacturer of radiators and stoves, has awarded a general contract to the Connecticut Engineering Co., Norwich, for a new building on South Thames Street, 50 x 253 ft.

M. R. Drew, 288 Main Street, Greenfield, Mass., architect, has plans under way for a five-story automobile service, repair and garage building, 200 x 210 ft., on Federal Street, with accommodations for 600 cars, estimated to cost $200,000 with equipment. The owner's name is temporarily withheld.

Detroit

DETROIT, March 31.

BIDS will be asked in April by the Clover Foundry Co., Clay and Eleventh streets, Muskegon, Mich., for a one-story addition, 60x170 ft., estimated to cost about $35,000. Vanderwest & Child, Montgomery Building, are architects. Charles S. Clover is president.

The Continental Motors Corporation, 12,801 Jefferson Avenue, Detroit, manufacturer of automobile engines, etc., is disposing of a bond issue of $7,500,000, a portion of the proceeds to be used for extensions. R. W. Judson is president.

The Wise Electric Sherardizing Co., 6320 East Fort Street, Detroit, will begin the erection of a new one-story plant on Mount Elliott Avenue, 70x215 ft., estimated to cost $55,000, including equipment.

The Boyne River Power Co., Boyne City, Mich., has tentative plans for the construction of a steam-operated electric power plant with capacity of about 1500 kw., to be used for emergency service.

The Gluetite Panel & Veneer Co., Cadillac, Mich., has preliminary plans for rebuilding the portion of its plant destroyed by fire March 17, with loss estimated at $75,000 including equipment.

The Wolverine Porcelain & Enameling Co., 3351 Scotten Street, Detroit, is perfecting plans for an addition, one story, 80x120 ft., to cost $70,000. A portion of the structure will be equipped as a machine shop. The company is operated by the Porcelain Enamel & Mfg. Co., Baltimore.

Manual training equipment will be installed in the high school to be erected at Big Rapids, Mich., estimated to cost $150,000, for which it is expected to ask bids on a general contract at an early date. Frank Forster, Lyman Building, Muskegon, Mich., is architect.

Cleveland

CLEVELAND, March 31.

MACHINE-TOOL inquiry improved somewhat during the week, but sales hardly kept up to recent volume. Some manufacturers and dealers report that their March business will show up slightly better than February, but with others the volume of sales fell off this month. Buying is still largely confined to single machines. Detroit is quiet although automobile manufacturers are placing some scattering orders for fill-in machinery. A northern Ohio car manufacturer during the week purchased five machines. Used machinery is in fair demand, but buyers are looking for tools in very good condition and in some cases are having difficulty in finding what they want.

The Gillman Mfg. Co., East Boston, Mass., purchased during the week six turret lathes from a Cleveland manufacturer. The Libby-Owens Sheet Glass Co., Toledo, is placing machinery for plant extensions, its requirements including 9 tools. The Pittsburgh Plate Glass Co. has an inquiry out for two 20-in. lathes, a 4-ft. radial drilling machine and a shaper and the Electric Vacuum Cleaner Co., Cleveland, is inquiring for a used milling machine and surface grinder.

The Ohio Brass Co., Mansfield, Ohio, will erect an additional story 50 x 150 ft. on one of its factory buildings. DeVore & Co., 908 Nichols Building, Toledo, are the architects.

The Walworth Run Foundry Co., Cleveland, has purchased a 2-acre site adjoining its plant for future extensions.

The Artkraft Sign Co., Lima, Ohio, plans to erect a $40,000 factory, 60 x 250 ft. Charles G. Myers is president and R. R. Trubey is secretary.

The city of Wadsworth, Ohio, will take bids shortly for a sewage disposal plant involving an expenditure of $125,000. R. E. Garvin, Davis & Farley Building, Cleveland, is the consulting engineer.

The city of Steubenville, Ohio, contemplates the expenditure of $300,000 for alterations and extensions to its filtration plant. J. H. Chester, Union Bank Building, Pittsburgh, is the consulting engineer.

The Toledo Floor Surfacing Co., Toledo, Ohio, contemplates the erection of a two or three story factory building, 50 x 150 ft. Rhines, Bellman & Nordhoff, 1234 The Ohio Building, are the architects.

The American Can Co. has started the erection of a one-story, 60 x 110 ft. addition to its Toledo, Ohio, plant.

The city of Alliance, Ohio, is contemplating the erection of a sewage disposal plant and the provision of a water supply system at an estimated cost of $750,000. A. O. Anderson is the city engineer.

Fire, March 26, destroyed the three-story plant and equipment of the Wilson-Painter Electric Co., Canton, Ohio, entailing a loss of $100,000. No rebuilding plans have been made.

Manual training and vocational departments will be installed in the new high school to be erected at Mansfield, Ohio, for which a site has just been secured. The Board of Education is in charge.

Cincinnati

CINCINNATI, March 31.

WHILE there were no large orders for machine tools the past week, buying was fairly well maintained. Practically all bookings are for one and two machines, and come from widely scattered points. Automotive interests continue to place orders to round out equipment, but business from this industry lacks the snap noticeable some months ago. Railroads are expected to be heavy purchasers during the next two or three months, which will go far toward enabling manufacturers to maintain present operating schedules. Inquiry continues good, and it is expected that some of those pending will shortly develop into orders.

The Ludlow Battery & Ignition Co., Dayton, Ohio, plans the erection of a new battery and automobile service station at Springfield, Ohio. Dismantling of buildings now occupying the site has begun and bids will soon be asked for the erection of the new plant.

The W. J. Hughes Lumber Co., Louisville, Ky., will shortly commence the erection of a woodworking plant to replace the one destroyed by fire several weeks ago. With machinery to be installed, it will cost approximately $225,000.

The Car-Mac Mfg. Co., Washington Courthouse, Ohio, has been organized with capital of $25,000 to manufacture battery boxes. It has leased temporary quarters on East Point Street, in which machinery is being installed. F. E. Jones, Jackson, Ohio, is president and W. H. Carlough, Washington Courthouse, secretary.

The foundry of M. Hertenstein & Co., Columbus, Ohio, was damaged by fire March 18, necessitating the closing down of the plant for a few days. The principal damage was in the core room. It will be rebuilt immediately.

Considerable equipment will be required by the Athens Plow Co., Athens, Tenn., in connection with a new foundry, estimated to cost $40,000.

J. C. Bruce, Jackson, Tenn., is in the market for a motor driven air compressor.

The Peeler Mfg. Co., 1104 South Street, Nashville, Tenn., manufacturer of piston rings, etc., is planning for enlargements and the installation of additional machinery. M. L. Baxter and F. H. Galloway head the company.

The Southern Agricultural Chemical Corporation, 61 Broadway, New York, has awarded a general contract to the Ferro Concrete Construction Co., Cincinnati, for a four-story plant, 120 x 320 ft., at Evendale, near Cincinnati, estimated to cost $65,000.

The Cole Mfg. Co., 789 South Fourth Street, Memphis, Tenn., manufacturer of lubricating oils, etc., is having plans drawn for an addition to cost $45,000 with equipment. Two additional units, costing approximately a like amount, will be built later.

The Lunkenheimer Co., Waverly Avenue and Beekman Street, Cincinnati, manufacturer of valves, steam specialties, etc., will begin the erection of its one-story machine shop at Carthage, Ohio, 307x410 ft., estimated to cost $125,000. Fosdick & Hilimer, Union Trust Building, Cincinnati, are architects.

The Mississippi River Commission, First and Second districts, McCall Building, Memphis, Tenn., will take bids until April 7 for a number of oil-burning furnace installations complete.

The Central Auto Supply Co., 629 East Main Street, Louisville, has tentative plans for the erection of a new factory to manufacture automobile equipment. W. R. Roose is head.

South Atlantic States

BALTIMORE, March 31.

CHARLES C. STEIFF & CO., 311 West Redwood Street, Baltimore, manufacturers of silverware and plated products, will begin the erection of a new one-story plant on Cedar Avenue, to cost approximately $200,000 with equipment. The general contract has been let to L. L. Chambers, Thirty-sixth and Roland Streets.

M. Wolf, 1502 North Smallwood Street, Baltimore, architect, is preparing plans for a two-story automobile service and repair building at Monroe and Pressman Streets, to cost $90,000 with equipment. The name of the operating company is temporarily withheld.

The Youghiogheny Hydro-Electric Corporation, F. T. Hepburn, 14 Wall Street, New York, president, recently formed, will begin the construction of a hydroelectric generating plant on the Youghiogheny River, near Oakland, Md., with capacity of about 25,000 hp. This is the first of four such power plants to be built, each with estimated cost placed at $600,000. Charles B. Hawley & Co., Inc., 1103 Munsey Building, Washington, D. C., is engineer.

The Bureau of Supplies and Accounts, Navy Department, Washington, will take bids until April 15 for a quantity of magnet wire for the San Diego Navy Yard, schedule 2009, and for a quantity of wire cloth for Eastern and Western yards, schedule 2012; until April 22 for rotary converters and spare parts for Eastern and Western yards, schedule 2031, for one duplex pump and one set spare parts, for the Puget Sound, Navy Yard, schedule 2033.

The General Reduction Co., Dry Branch, Ga., is making inquiries for equipment for its proposed plant on property near Macon, Ga., including locomotive crane, conveying machinery, steam shovels, elevating and kindred equipment.

The American Thread Co., 260 West Broadway, New York, will build a power house and pumping plant in connection with its new plant in the vicinity of Dalton, Ga., on which work has begun. All machinery will be electrically operated. It will cost in excess of $1,000,000.

T. T. Todd, Simpsonville, N. C., has leased a local building and will install machinery for the manufacture of implement handles and other turned wood products. The equipment will be electrically operated.

The Vestal Lumber & Mfg. Co., Knoxville, Tenn., is reported to have purchased about 10,000 acres of timber land in southern Georgia, and has plans under way for the construction of a sawmill, planing mill, machine shop and power house, to cost $100,000 with equipment.

The Frederick County Products Co., Inc., Frederick, Md., will soon begin the construction of a one-story ice-manufacturing and refrigerating plant to cost $70,000. Col. P. M. Anderson, Southern Building, Washington, is architect and engineer.

D. C. Elphinstone, Continental Building, Baltimore, machinery dealer, has inquiries out for one 15 to 20-ton locomotive, 30-in. gage, for a number of 2-way dump cars, each about 3 to 5-yd. capacity, 30-in. gage.

The general purchasing officer, Panama Canal, Washington, will take bids until April 8 for 1000 lb. electric welding wire; 25 steel reflectors; 6 gate valves; 12 compression cocks; 28 metal saws; 18 pressure gages; 48 brass grease cups; 50 mounted switches, and kindred equipment, circular 2349; until April 5 for 500 ft. galvanized chain and 1000 lb. soft steel, R-9429-A5; for 344 machinists' chisels and 108 standard chisels, R-9465-A5; and for 144 coping saw blades, R-2467-A5.

Harold M. Prager, Savannah, Ga., and T. B. Carr, Southport, N. C., have organized a company with capital of $250,000, to build a fish-canning plant, to include a steam-operated power plant, estimated to cost $100,000. Similar plants are projected in different parts of the State.

L. N. Jordan, Milledgeville, Ga., operating a machine works, plans to purchase an electric-operated drill, lathe, and other equipment.

The Consolidated Gas, Electric Light & Power Co., Lexington Building, Baltimore, has plans for a one-story steam-operated power house, 47 x 95 ft., at Race and Barney Streets, to cost approximately $40,000.

The Carolina Steel & Iron Co., Greensboro, N. C., is considering the installation of additional equipment at its plant, including saw-sharpening machine for metal-cutting saws; punch; combination disk and roll sander and other tools. W. E. Truitt is vice-president.

The Haywood County Board of Education, Waynesville, N. C., is considering the installation of manual training equipment in the proposed local high school, estimated to cost $110,000.

The United States Shipping Board Emergency Fleet Corporation, Washington, will receive bids until April 9 for furnishing its requirements, covering six months, of valves, gaskets and packings.

George W. Beckett, Beaufort, S. C., is making inquiries for centrifugal pumping equipment suitable for sand-dredging work.

The Southern Railway Co., Washington, has taken options on 185 acres at Hayne, near Spartanburg, S. C., for new car and locomotive repair shops, to replace the plant destroyed by fire several weeks ago at Gadsden, Ala. The different units with power house are estimated to cost $400,000.

The Common Council, Dallas, N. C., plans the installation of electric-operated pumping equipment in connection with its proposed municipal waterworks system, estimated to cost $50,000. J. P. Hoffman, is city clerk.

The A. A. Cady Stave Mill, Waycross, Ga., is planning for the installation of a department for the manufacture of tin cups for catching gum of pine trees, and other kindred specialties, and is interested in receiving information regarding metal-working equipment.

The Commerce Iron Works, 17 Guilford Avenue, Baltimore, organized with capital stock of $20,000, purposes to fabricate structural steel and ornamental iron work. In the near future it will be in a position to warehouse structural shapes. Some changes will be made in the present plant. It is in the market for a few machines required in fabricating and will purchase structural shapes. W. L. Godman, formerly of the Structural & Ornamental Steel Sales Co., Baltimore, heads the company.

Plans have been filed for six additional units at the plant of the Standard Sanitary Mfg. Co., Canton, Baltimore, consisting of two 62 x 345 ft. enameling shops, two 97 x 102 ft. cleaning houses, 35 x 82 ft. slush house and 35 x 82 ft. sawmill. Work is under way on a 97 x 589 ft. foundry, 100 x 250 ft. machine shop, 132 x 107 ft. power house and 171 x 350 ft. warehouse.

Indiana

INDIANAPOLIS, March 31.

NEW interests, represented by Byram C. Robbins, Richmond, Ind., have acquired a controlling interest in the Frankfort Heating Co., Frankfort, Ind., operating a central power plant and heating system. Plans are under consideration for enlargements and the installation of additional equipment. W. P. Sidwell will remain as secretary and treasurer.

The Board of Public Works, City Hall, Indianapolis, will take bids about April 15 for a two-story and basement municipal service, repair and garage building, estimated to cost $165,000 with equipment. Frank B. Hunter, 912 State Life Building, is architect.

The Columbus Wood Turning Co., Crothersville, Ind., manufacturer of tool and implement handles, etc., has acquired property at Paoli, Ind., and contemplates the erection of a new plant to cost $50,000 including machinery. Harry Chapman is president and Bruce C. McDonald, secretary and treasurer.

Manual training equipment will be installed in the two-story and basement high school to be erected at East Chicago, Ind., to be known as the Todd Park school, estimated to cost $400,000, for which bids are being asked on a general contract until April 9. Karl D. Norris, Calumet Building, is architect.

The Overhead Door Co., Hartford, Ind., is perfecting plans for the construction of a new plant at Lewistown, Pa., estimated to cost $40,000.

The Indiana Electric Corporation, Indianapolis, has completed plans for the construction of a new generating station estimated to cost about $200,000 including equipment.

The General Motors Truck Co., 464 North Capitol Avenue, Indianapolis, has leased a one-story building to be erected at 1117-19 North Capitol Avenue, to cost approximately $90,000, for a new service and repair works.

Officials of the Interstate Public Service Co., Indianapolis, have organized the Interstate Power Co., capitalized at $1,000,000, to be operated as a subsidiary. It plans the construction of a high-tension transmission line from Jeffersonville to Scottsburg, and has selected a site at the first noted place for the erection of a steam-operated electric power plant later. Harry Reid and E. Van Arsdel head the organization.

The Oakland City Water Co., Oakland City, Ind., is considering the installation of electric-operated pumping equipment in connection with its proposed local water system. It will issue stock for $80,000 to cover the cost.

The Volcker Mfg. Co., Inc., Huntington, Ind., recently incorporated with $50,000 capital stock, will manufacture gasoline pumps, oil pumps, jobbers' equipment, service station and refiners' equipment. Limited operations have been under way for about six months and ground has now been broken for a factory. The company is interested in manufacturing materials. M. G. Volcker is at the head.

Construction will soon begin on a $100,000 plant for the manufacture of vitreous bathroom fixtures by the Rockport Sanitary Pottery Co., Rockport, Ind. Daniel Copp is secretary and general manager.

Milwaukee

MILWAUKEE, March 31.

VOLUME of machine-tools sales in March is generally reported as somewhat in excess of January and February, although falling below that in March, last year. Toward the close of the month there has been an improvement in inquiry. Some of the larger automotive interests are again showing interest in production tools, but this is largely replacement business. The prospective large list expected to be issued by the Nash Motors Co., Kenosha, Wis., for tooling the former Mitchell automobile works in Racine, remains indefinite.

The B. F. Sturtevant Co., Hyde Park, Boston, Mass., which recently purchased and retooled the former Wisconsin Engine Co. works at Corliss, now Sturtevant, Wis., has incorporated this group as the B. F. Sturtevant Co., Western Division, Inc., in Massachusetts. The capital stock is $500,000, of which amount $25,000 is allotted to Wisconsin interests. Harry W. Page, general manager Sturtevant works, is Wisconsin agent. The plant is now being operated on a full time schedule.

The Sterling Tool & Mfg. Co., Milwaukee, which for several years has been operating in leased quarters at 455-459 Broadway, has decided to erect a plant of its own at 1285-1295 Thirtieth Street. The first unit will be 40 x 120 ft., and cost about $25,000, including additional equipment. The Federal Engineering Co., 444 Milwaukee Street, is architect, engineer and general contractor.

The Northwestern Motor Car Co., 2418-2428 North Avenue, Milwaukee, Ford and Lincoln dealer, plans improvements, bids on which will be taken April 5 by Voelz & Siebert, architects, 373 Broadway. The service department will be given additional equipment and an oil-burner steam heating system will be installed throughout. Louis A. Snetcamp is president and general manager.

The Warnkey Sheet Metal Works, West Bend, Wis., has engaged the Federal Engineering Co., 444 Milwaukee Street, Milwaukee, to design, erect and equip a $20,000 addition to be ready about June 15. William Warnkey is proprietor and manager.

The Greiner Nash Co., Kenosha, Wis., which will build a $50,000 sales and service building, 80 x 140 ft., two-stories and basement, let the general work to John Zoubek, local contractor, at $35,400. Ground will be broken April 5. White & Co., local architects and engineers, are in charge. A. W. Greiner is president.

The Frankenberg Refrigerating Machine Co., 345 Jackson Street, Milwaukee, which recently increased its capitalization from $50,000 to $100,000, contemplates the erection of its own machine and assembling shop at another location. It builds commercial and household refrigerating units. An architect and engineer will be appointed at once. Julius Frankenberg, chief engineer, is outlining equipment needs, which will consist both of new and used machinery.

The Belle City Malleable Iron Co., Racine, Wis., let the contract to Nelson & Co., Inc., local builder, for a brick and steel garage and service shop, 54 x 84 ft., part two-stories. This is a part of an $800,000 plant replacement project in charge of P. M. Adams, consulting engineer.

The Mertz-Knippel Co., 6620 Greenfield Avenue, West Allis, Wis., has contracted with the Paul Riesen & Sons Co., 1918 Humboldt Avenue, for a $50,000 garage, sales and service building at 6724-6728 Greenfield Avenue.

The West Leechburg Steel Co. has removed its general offices from rooms 1519-1526 to rooms 803-813, Farmers Bank Building, Pittsburgh.

Pacific Coast

SAN FRANCISCO, March 26.

BIDS are being asked by the City Commissioner of Light and Water, Room 402, City Hall, Tacoma, Wash., until April 16 for electric and mechanical equipment for the Lake Cushman municipal power project, including two vertical hydraulic turbines, each with capacity of 27,500 hp.; two vertical electric generators, each 20,000 kva., with two direct-connected exciters, one motor-driven spare exciter, and three exciter field rheostats; transformers, electric condenser, and auxiliary equipment. J. L. Stannard is chief engineer.

The Chicago Pneumatic Tool Co., Los Angeles, has awarded contract to Robert E. Millsap, Marsh-Strong Building, for its new one-story plant, 50x140 ft. Monaco & Bordeaux, International Bank Building, are architects. Headquarters of the company are at 6 East Forty-fourth Street, New York.

The Day & Night Solar Heater Co., Monrovia, Cal., is having plans drawn for a new one-story plant for the manufacture of heating equipment, 150x200 ft., estimated to cost $55,000. Hamm & Grant, Ferguson Building, Los Angeles, are engineers.

The Kleiber Motor Truck Co., San Francisco, will begin the erection of a new plant at Folsom and Tenth Streets for the manufacture of passenger automobiles and parts, to cost $150,000.

The Mountain States Power Co., Sandpoint, Idaho, is perfecting plans for the construction of a steam-operated electric power plant at North Bend, Ore., with initial capacity of 6700 hp., estimated to cost $650,000 with machinery.

The Red River Lumber Co., Westwood (Lassen County), Cal., is considering preliminary plans for the erection of a new veneer mill and power house, estimated to cost $500,000 with machinery. J. B. Walker is president.

The Pacific Portland Cement Co., Consolidated Pacific Building, San Francisco, has work in progress on an expansion and improvement program to cost about $3,000,000. The company has recently increased its capital from $6,000,000 to $10,000,000. Robert B. Henderson is president.

The Gotfredson Truck Corporation, Los Angeles, is having plans prepared for a one-story service and repair building, 75x230 ft., estimated to cost $65,000. Morgan, Walls & Clements, 1124 Van Nuys Building, are architects in charge. B. G. Gotfredson is president.

The Sperry Flour Co., Seventh and Alameda Streets, Los Angeles, with headquarters at 141 California Street, San Francisco, will build a steam power plant and machine shop at its proposed milling plant on a 6-acre site recently purchased at Los Angeles, estimated to cost $1,000,000 with machinery. Plans are being drawn by Maurice C. Couchot, 110 Sutter Street, San Francisco, architect and engineer.

The Pacific Malleable Castings Co., Oakland, Cal., recently organized by officials of the Best Steel Casting Co., with local plant, and other interests, is preparing to begin the erection of its initial plant on a 15-acre tract at Eighty-fifth Avenue and the Southern Pacific Railroad, recently acquired. It will be 160x360 ft., primarily for the production of malleable iron castings. A list of equipment is being arranged. H. H. Whiting, president of the Best company, will act in the same capacity with the new organization; John Tuohy, vice-president of the Best company, will be vice-president. It is understood that W. A. Forbes and G. O. Forbes, president and secretary-treasurer of the Rockford Malleable Iron Works, Rockford, Ill., are interested in the new company.

Charles C. Garland, Tacoma, Wash., engineer, has plans for a hydroelectric power house at Longview, Wash., including power dam in the Toutle River, estimated to cost $4,000,000.

Gulf States

BIRMINGHAM, March 31.

A BOND issue of $2,000,000 is being sold by the Houston Lighting & Power Co., Houston, Tex., a portion of the proceeds to be used for extensions in power plant and system. Edwin B. Parker is president.

The State Board of Education, Baton Rouge, La., has preliminary plans for the construction of a junior high school at Haynesville, La., to include a manual training department. It will cost $275,000. M. M. Morelock, Haynesville, a member of the school board, is interested in the project.

The Lone Star Tank Car Co., P. O. Box 1445, Wichita Falls, Tex., has purchased 4 acres on the Saginaw Road, Fort Worth, Tex., as a site for a new tank car and plate works, to cost approximately $85,000. The installation will

include air compressors, steel tanks, combined shear and punch, hoisting equipment and traveling crane.

The Marble Falls Textile Mills, Marble Falls, Tex., plan the construction of a power house in connection with their proposed mills, estimated to cost $500,000.

The Bartran Hoe Works, 430 Front Street, Laurel, Miss., incorporated with capital stock of $10,000, will manufacture weeding hoes. Floor space has been rented and the company is in the market for equipment and material. John Anderson is president; D. W. Bartran, vice-president and manager, and C. H. Ferrill, secretary-treasurer.

The Air Reduction Co., Inc., 342 Madison Avenue, New York, manufacturer of industrial oxygen, etc., has selected a site at North Birmingham for its proposed plant in this section, estimated to cost $350,000 including machinery. Francisco & Jacobus, 511 Fifth Avenue, New York, are architects and engineers.

The Anderson-Prichard Oil Co., Oklahoma City, Okla., has purchased 12 acres at Colorado, Tex., for a new refinery, for which plans will be drawn at once, estimated to cost $175,000. The company is also planning for the construction of a high pressure pipe line from the oil fields to the new refinery, with pumping plant, to cost approximately $150,000. J. Steve Anderson is vice-president.

The Enamel Products Corporation, Birmingham, has acquired a three-story building at 2221 Avenue A, and will soon begin the installation of equipment for the manufacture of enameled iron sanitary ware, estimated to cost approximately $35,000. The company is said to be affiliated with the company of the same name at 874 Broadway, New York. J. H. Dargin, head.

The Massey Mfg. Co., Houston, Tex., has preliminary plans for rebuilding the portion of its planing mill and lumber plant at Yale Street and Railroad Avenue, destroyed by fire March 20, with loss estimated at $70,000, including equipment.

The Standard Equipment Co., Birmingham, machinery dealer, is in the market for two gyratory crushers, about No. 18 or 22; a large jaw crusher, 36x48 in.; two steam shovels, Marion or Bucyrus types; a number of gondola bottom dump cars, and about 80 flat cars, 40 to 42 ft., as well as dump cars, approximately 4 yd. capacity each.

The Mengel Co., Louisville, manufacturer of boxes and other wood products, has acquired about 90 acres near Baton Rouge, La., as a site for a new hardwood manufacturing plant, with power house, estimated to cost $1,000,000 with machinery.

T. V. Ballard, Troy, Ala., and associates, are perfecting plans for the erection of a new ice and cold storage plant estimated to cost $70,000 including equipment. J. A. Stallings, Henderson, Ala., is also interested in the project.

Officials of the Chamber of Commerce, Laredo, Tex., are perfecting plans for the construction of a fertilizer plant, and are making inquiries for information regarding machinery. The erection of a cottonseed oil mill is also being considered.

Vocational and manual training departments will be installed in the two new schools to be erected at Biloxi, Miss., at a cost of $50,000 each and for which the general contract has been awarded to the Collins Brothers Construction Co., Biloxi.

Canada

TORONTO, March 31.

DEMAND for machine tools continues and prospective buyers are sending out inquiries for equipment for replacement purposes and new works. Sales the past week were chiefly for two or three tools to a customer, but some fairly good sized lists are being figured. A large amount of construction work is proposed in the near future on new plants and additions for which practically all classes of machinery will be in demand.

The automotive industry is a steady customer, and woodworking equipment is also in good call. Small tools and supplies have been moving freely and dealers report a continual flow of orders for this line.

The Cassady Tool Co., is arranging for the erection of a manufacturing plant at Paris, Ont.

The Gulf Pulp & Paper Co., 71 St. Peter Street, Quebec, is having plans prepared for the erection of a pulp and paper mill.

Peat Fuels, Ltd., 230 Dorchester Street West, Montreal, is making alterations to its plant, which include changing from steam to electricity, and the company is asking prices on electrical equipment. E. V. Moore is engineer and purchasing agent.

The Niagara Wire Weaving Co., Robinson and Buchanan Streets, Niagara Falls, Ont., has awarded a general contract to the Frid Construction Co., Ltd., Hamilton, for an addition to cost $41,500.

The Bickle Fire Engine Co., Woodstock, Ont., has awarded general contract to W. J. Taylor, 14 Wellington Street, for an addition to cost $27,000.

The Almonte Electric Light Commission, Almonte, Ont., is having plans prepared for a dam and electric light plant to cost $30,000. Charles Barber & Sons, Meaford, Ont., are the engineers.

The Globe Stamping Co., has been formed to take over the plant and business formerly carried on by J. H. Messner, 232 Albert Street South, Kitchener, Ont. The new company proposes to build an addition to manufacture trunk hardware, automobile window regulators, hinges, door catches, etc. J. Messner is president and A. V. Armbrust, secretary and treasurer of the new company which is capitalized at $100,000.

Western Canada

The city of Prince Albert, Sask., is having plans prepared for an addition to the power plant to accommodate new equipment, including turbine generator, 600 hp., water tube boiler, superheaters, two boilers, automatic stoker, overhead bunkers and accessories.

Spillers, Ltd., has started work on the erection of a grain elevator at Vancouver, B. C., which is expected to be ready for operation Sept. 1. It will cost $2,500,000 exclusive of jetties, and will have a capacity of 2,000,000 bu.

The Powell River Pulp & Paper Co., Powell River, B. C., has a development program under consideration, including additions to cost $4,000,000.

The Minister of Public Works, Victoria, B. C., is receiving bids for the erection of power house with equipment and six buildings for the University of British Columbia.

Contract for the erection of the Government elevator in the Bronx sub-division of Edmonton, Alberta, has been awarded to Carter-Halls-Aldinger, Winnipeg, Man. It will have a capacity of 2,500,000 bu. and must be completed by Sept. 15. The necessary pile driving has been completed by the Government and construction work will start immediately.

Improvement of National Acme

The National Acme Co., Cleveland, in its annual report for 1923 shows a marked improvement in its financial situation over 1922. Of future prospects President A. W. Henn said in his annual report:

"There has been a slight increase in foreign business and the immediate prospects are also more encouraging than at any time during the past five years, although at the best we cannot expect more than a fraction of the pre-war volume until the exchange situation has radically improved."

Net sales during 1923 totaled $9,586,306, as compared with $5,618,236 during 1922. Manufacturing profit last year was $1,698,295; operating profit, $794,692, and the net profit $240,717, as compared with manufacturing profit of $575,034, operating loss of $170,173 and net loss of $805,010 for 1922. Bank loans which at the peak were $1,350,000 were reduced to $650,000, and $360,000 in bonds was retired. These items, in addition to bond interest, made disbursements other than ordinary, of $1,435,000. President Henn stated further in his report that total sales for the year exceeded $9,500,000, sufficient to yield a good return under reasonably favorable conditions. "The difficulty with respect to profits," he said, "is attributable primarily to machinery market at too low a level and product business done on too close a margin.

"Except for a short period just about a year ago there was no real active demand for our machines during 1923. Sales for the year indicated operations at approximately one-third of normal capacity, an insufficient volume to enable making a satisfactory return. After so monotonous and inactive a market for machine tools, now exceeding three years in duration, an early improvement seems imminent. Already the trend is upward and the current year should be radically better than any since 1920.

"Our screw product department records show parts made in excess of 590,000,000, or more than 2,000,000 for each working day. This involved a consumption of material closely approximating 45,750,000 lb. These quantities are next to the largest of record for any year to date. Regrettably upon much of this volume, due to excessively keen competition, the margin of profit was often quite negligible. But improved processes of manufacture, some of the more important ones being of relatively recent introduction, justify the expectation of soon again operating this department at a profit more nearly commensurate with the volume, a condition that has not obtained for the past three years."

NEW TRADE PUBLICATIONS

Special Machinery.—C. H. Cowdrey Machine Works, Fitchburg, Mass. Small folder illustrating and describing the special machines this plant builds, stressing knitting machines, automatic candy wrapping machines, special wire winding machines and a universal chaser grinder.

Automatic Machinery.—Baird Machine Co., Bridgeport, Conn. An 8-page folder giving brief descriptions of some of the Baird special automatic machines, together with lists of the products made on these machines. The machines shown include the Baird chucking machine, a spring-making machine, automatic press, tandem press, tumbling barrels, tool and die grinder.

Rivets, Staples, Tacks, Etc.—Cobb & Drew, Inc., Plymouth, Mass. A 24-page illustrated booklet giving various data on rivets, staples, tacks, small nails, double-pointed tacks, small washers and riveting burrs, cotters, etc., made from open-hearth steel, Norway iron, brass, copper, aluminum, nickel and monel metal.

Air Squeezers.—Adams Co., Dubuque, Iowa. An 8-page illustrated folder issued as a supplement to its catalog No. 30, giving full information regarding the 36-in. Adams air squeezer, portable type, and the 32-in. squeezer, stationary type.

Steel Products for the Petroleum Industry.—Emsco Steel Products Co., 7101 South Alameda Street, Los Angeles, Cal. A 24-page illustrated booklet, 9 x 12 in., giving complete information and illustrations of the company's products, which include steel derricks, bull wheels, calf wheels, band wheels, sand reels, tug rims, crown blocks, casing blocks, tool joints, drill stems, forged steel flanges, blowout preventers, circulating heads, steel tubing block, well-pulling hoist, all products for the petroleum industry. The company also maintains a job galvanizing service.

Steel Buildings Products.—Milwaukee Corrugating Co., Milwaukee, Wis. An elaborately printed and illustrated booklet of 64 pages and cover, 9 x 12 in. It is a data book for architects and builders, giving them complete information regarding the various products of the company, such as Stay-Rib and Netmesh expanded metal lath, expansion corner bead, casings, steel domes, channels and other fireproof building products.

Portable Mine Car Air Compressors.—Sullivan Machinery Co., Chicago. 16-page catalog describing in detail compressors mounted on a special truck for use in mines. Electric drive is used. The sizes vary from 10 to 40 motor hp., with the overall dimensions of the outfit varying from 6 ft. 4 in. by 4 ft. to 9 ft. 5 in. by 5 ft. 9 in. The height above the rail varies from 3 ft. 1 in. to 3 ft. 11 in. The catalog shows details of parts, as well as illustrations of the equipment complete and in use.

Portable Air Compressors.—Sullivan Machinery Co., Chicago 16-page catalog devoted to three types of portable compressors, driven respectively by gas engine, by belt from electric motor, and by belt from tractor. The air receivers are 22 by 48 in., except for the tractor type, in which they are 26 by 33 in. The power varies from 18 to 40 hp., depending upon the size and type. The catalog shows many uses, particularly on construction and other outdoor jobs.

Concrete Breaker.—Sullivan Machinery Co., Chicago. Eight-page catalog describing a portable compressed air hammer designed for breaking concrete pavements and walls and for other similar purposes. Illustrations of the equipment in use are shown, indicating a considerable variety of applications of the tool.

Railroad and Industrial Oil-Burning Equipment.—Mahr Mfg. Co., Minneapolis, Minn. 68-page catalog of equipment under the general title given, going all the way from hand torches to heat treating and tire heating furnaces. Both oil-fired and gas-fired furnaces are covered for a great variety of purposes and in a variety of sizes. These are illustrated by line cuts and half tones in considerable number. The use of fuel oil is given special attention, with particular reference to methods of handling the oil to the burners.

Cooperation Between Buyer and Seller.—Mahr Mfg. Co., Minneapolis, Minn. 8-page pamphlet, Bulletin C, sets forth principles and practices adopted by the company in the sale of its products and in purchases. The foreword emphasizes belief in rightful, intelligent cooperation between buyer and seller, because this eliminates waste of time and results in more economical buying from the viewpoint of serviceability, durability and salability. The pamphlet bears the signature of W. M. Horner, president of the company.

Sanitation System.—Kaustine Co., Buffalo. Twenty-four-page catalog devoted to the sanitation of schools, homes, factories and villages located in unsewered districts. Railroads, camps and summer cottages come under this heading. A disposal of sewage by the chemical sterilization method, together with ventilation, are provided by this system. The catalog discloses leaching pools and drainage, together with accessory materials connected with the operation of the system.

Enameled Iron Septic Tanks.—Kaustine Co., Buffalo. Folder devoted to septic tanks made of Armco ingot iron. Diagrams and illustrations show the method of operation of this tank, which is particularly fitted for detached buildings, such as country homes, schools, etc.

Air Compressors.—Champion Pneumatic Machinery Co., Chicago. Thirty-two-page catalog of air compressors for automobile service stations, garages, tire shops and various industrial requirements. Both single-stage and double-stage compressors are featured, varying from piston displacements of 1½ cu. ft. per min. to 14 cu. ft. A wide variety of machines is shown, both portable and stationary, together with details of the different parts and tables of sizes, with general specifications of the different units.

Hot-Dip Galvanizing.—Bessemer Galvanizing Works, Birmingham, Ala. Twelve-page pamphlet dealing with the life of galvanized iron or steel as affected by the thickness of the zinc coating. An example is given of a fire-escape of plain steel costing $1,000 fabricated, with $250 for erection and $50 cost of dismantling after ten years. The cost per year was $130. A corresponding fire-escape galvanized at $1,250 fabricated, plus $250 for erection, totals $1,500, and with a life of forty years works out at about $38 per year in place of $130.

Wire Rope.—MacWhyte Co., Kenosha, Wis. An 80 page booklet intended to provide complete information on the company's line of wire rope, including in its pages photographs of various departments of the works sections of rope of different strands, drawings of cross-sections of rope, accessories and prices.

Sheet Metal Products.—Canton Art Metal Co., Canton, Ohio. Four booklets recently issued by this company deal with the various products which it manufactures from sheets. The largest, of 47 pages, describes and illustrates metal furniture and filing equipment, a 32 page booklet illustrates many of the special sheet metal products made by this company, a 24 page booklet deals with skylights and a pamphlet illustrates the design and construction of the company's metal ceilings.

Pulleys.—Winfield H. Smith, 10-16 Lock Street, Buffalo, N. Y. Catalog No. 21 gives specifications and prices with illustrations of the pulleys, arbor presses, reducing gears and revolving display tables manufactured by this company.

Floor Tiles.—Norton Co., Worcester, Mass. An illustrated folder shows the uses in various types of buildings to which the "Alundum" tile manufactured by this company has been applied.

Buckets.—Blaw-Knox Co., Pittsburgh. A 52 page catalog, replete with illustrations and bound in an embossed cover, describes the various types of buckets and where they are used. A number of letters of commendation from users are reproduced. Clear type and well-arranged illustrations make the booklet extremely readable, while the careful descriptions of equipment provide much solid information.

Thermometers.—C. J. Tagliabue Mfg. Co., 18-88 Thirty-third Street, Brooklyn, N. Y. A 16 page booklet recently issued by this company includes a brief description of each type of instrument which it manufactures. Detailed information is given on the company's automatic controllers, recording and dial-indicating thermometers, vacuum gages, monogas-analysis recorders, oil testing instruments, hydrometers, laboratory thermometers and miscellaneous equipment.

Contractors' Machinery.—Oberlin Machinery Co., Oberlin, Ohio. Separate folders recently published by this company illustrate and briefly describe the various machines for road building and other contract work which it builds.

Boiler Return Trap.—Warren Webster & Co., Camden, N. J. Eight-page catalog of a trap used in connection with Webster modulation systems in steam heating for buildings. Diagrams and photographs of the equipment show its use and method of connecting into the line. The advantages claimed are quietness, complete inclosure of all moving parts, positive action, etc.

Current Metal Prices

On Small Lots, Delivered from Merchants' Stocks, New York City

The following quotations are made by New York City warehouses.

As there are many consumers whose requirements are not sufficiently heavy to warrant their placing orders with manufacturers for shipments in carload lots from mills, these prices are given for their convenience.

On a number of items the base price only is given, it being impossible to name every size.

The wholesale prices at which large lots are sold by manufacturers for direct shipment from mills are given in the market reports appearing in a preceding part of THE IRON AGE under the general heading of "Iron and Steel Markets" and "Non-Ferrous Metals."

Bars, Shapes and Plates

	Per Lb.
Bars:	
Refined iron bars, base price	3.54c.
Swedish charcoal iron bars, base	7.00c.
Soft steel bars, base price	3.54c.
Hoops, base price	5.19c.
Bands, base price	4.39c.
Beams and channels, angles and tees, 3 in. x ¼ in. and larger, base	3.64c.
Channels, angles and tees under 3 in. x ¼ in., base	3.54c.
Steel plates, ¼ in. and heavier	3.64c.

Merchant Steel

	Per Lb.
Tire, 1½ x ½ in. and larger	3.60c.
(Smooth finish, 1 to 2½ x ¼ in. and larger	4.10c.
Toe-calk, ½ x ⅜ in. and larger	4.60c.
Cold-rolled strip, soft and quarter hard	7.50c. to 8.50c.
Open-hearth, spring steel	4.50c. to 7.50c.
Shafting and Screw Stock:	
Rounds	4.40c.
Squares, flats and hex	4.90c.
Standard tool steel, base price	15.00c.
Extra tool steel	18.00c.
Special tool steel	23.00c.
High-speed steel, 18 per cent tungsten	75c. to 80c.

Sheets

Blue Annealed

	Per Lb.
No. 10	4.34c.
No. 12	4.39c.
No. 14	4.44c.
No. 16	4.54c.

Box Annealed—Black

	Soft Steel C. R., One Pass Per Lb.	Blued Stove Pipe Sheet Per Lb.
Nos. 18 to 20	4.55c. to 4.60c.	.....
Nos. 22 and 24	4.70c. to 4.75c.	5.10c.
No. 26	4.75c. to 4.80c.	5.15c.
No. 28*	4.85c. to 4.90c.	5.25c.
No. 30	5.05c. to 5.10c.	.....

Galvanized

	Per Lb.
No. 14	4.95c. to 5.00c.
No. 16	5.10c. to 5.15c.
Nos. 18 and 20	5.25c. to 5.30c.
Nos. 22 and 24	5.40c. to 5.45c.
No. 26	5.55c. to 5.60c.
No. 28*	5.85c. to 5.90c.
No. 30	6.30c. to 6.35c.

*No. 28 and lighter, 36 in. wide, 20c. higher.

Welded Pipe

Standard Steel	Black	Galv.	*Wrought Iron*	Black	Galv.
⅛ in. Butt	—41	—24	⅛ in. Butt	— 4	+19
¼ in. Butt	—46	—32	¼ in. Butt	—11	+ 9
1-3 in. Butt	—48	—34	1-1½ in. Butt.	—14	+ 6
2½-6 in. Lap.	—44	—30	2 in. Lap	— 5	+14
7-8 in. Lap	—41	—11	2½-6 in. Lap.	— 9	+ 9
9-12 in. Lap	—34	— 6	7-12 in. Lap	— 3	+16

Bolts and Screws

Machine bolts, cut thread, 45 and 10 to 50 and 10 per cent off list

Carriage bolts, cut thread, 35 to 35 and 10 per cent off list

Coach screws ..... 45 to 50 and 10 per cent off list

Wood screws, flat head iron, 75, 20, 10 and 7½ per cent off list

Steel Wire

BASE PRICE* ON NO. 9 GAGE AND COARSER	Per Lb.
Bright basic	4.50c. to 4.75c.
Annealed soft	4.50c. to 4.75c.
Galvanized annealed	5.15c. to 5.40c.
Coppered basic	5.15c. to 5.40c.
Tinned soft Bessemer	6.15c. to 6.40c.

*Regular extras for lighter gage.

Brass Sheet, Rod, Tube and Wire

BASE PRICE

High brass sheet	18¼c. to 19¼c.
High brass wire	18¾c. to 19¾c.
Brass rods	16 c. to 17 c.
Brass tube, brazed	26¼c. to 27¼c.
Brass tube, seamless	22½c. to 23½c.
Copper tube, seamless	23¾c. to 24¾c.

Copper Sheets

Sheet copper, hot rolled, 21¾c. to 22¼c. per lb. base.

Cold rolled, 14 oz. and heavier, 3c. per lb. advance over hot rolled.

Tin Plates

Bright Tin Grade "AAA" Charcoal 14x20	Bright Tin Grade "A" Charcoal 14x20	Coke—14 x 20	Prime	Seconds
		80 lb.	$6.55	$6.30
		90 lb.	6.65	6.40
		100 lb.	6.75	6.50
IC	$11.75	IC	7.00	6.75
IX	13.25	IX	8.25	8.00
IXX	14.50	IXX	9.50	9.25
IXXX	15.50	IXXX	10.75	10.50
IXXXX	16.50	IXXXX	12.00	10.75

Terne Plates

8 lb. coating, 14 x 20

100 lb.	$7.00 to $8.00
IC	7.25 to 8.25
IX	8.25 to 8.75
Fire door stock	9.00 to 10.00

Tin

Straits pig	58c.
Bar	60c. to 65c.

Copper

Lake ingot	16 c.
Electrolytic	15½c.
Casting	14½c.

Spelter and Sheet Zinc

Western spelter	8c.
Sheet zinc, No. 9 base, casks	10¾c. open 11½c.

Lead and Solder*

American pig lead	11c. to 12c.
Bar lead	14c. to 15c.
Solder ½ and ½ guaranteed	40c.
No. 1 solder	38c.
Refined solder	34c.

*Prices of solder indicated by private brand vary according to composition.

Babbitt Metal

Best grade, per lb	75c. to 90c.
Commercial grade, per lb	35c. to 50c.
Grade D, per lb	25c. to 35c.

Antimony

Asiatic	13c. to 14c.

Aluminum

No. 1 aluminum (guaranteed over 99 per cent pure), in ingots for remelting, per lb	36c.

Old Metals

The market continues uncertain and business is dull. Dealers' buying prices are as follows:

	Cents Per Lb.
Copper, heavy crucible	11.25
Copper, heavy wire	10.75
Copper, light bottoms	9.00
Brass, heavy	6.50
Brass, light	5.00
Heavy machine composition	8.75
No. 1 yellow brass turnings	6.75
No. 1 red brass or composition turnings	8.25
Lead, heavy	7.50
Lead, tea	5.75
Zinc	4.00
Cast aluminum	17.00
Sheet aluminum	17.00